BROOKLYN BOTANIC GARDEN RECORD

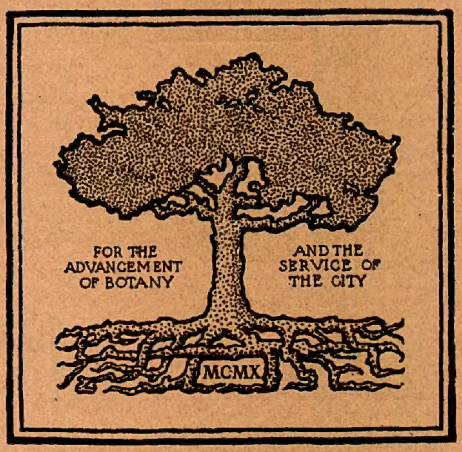
VOL. XXVIII JANUARY, 1939 NO. 1

CONTENTS

DELECTUS SEMINUM

BROOKLYN

1938



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BROOKLYN, N. Y.

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BROOKLYN BOTANIC GARDEN

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* Beginning January 1, 1939.
† Beginning October 1, 1938.

BROOKLYN
BOTANIC GARDEN
RECORD

VOL. XXVIII JANUARY, 1939 NO. 1

DELECTUS SEMINUM, BROOKLYN 1938

List of Seeds Offered in Exchange

These seeds, collected during 1938, are offered to botanic gardens and to other regular correspondents; also, in limited quantities, to members of the Brooklyn Botanic Garden. They are not offered for sale.

Please note that applications for seeds must be received during January or February. Seeds are mailed early in March. No seeds are available at other times of the year.

SEEDS OF TREES AND SHRUBS

Gymnospermae

Ginkgoaceae 4

Ginkgo
biloba L.

Taxaceae 5

Taxus
*canadensis Marsh.
cuspidata Sieb. & Zucc.

Pinaceae 6

Pinus
excelsa Wall.

Cupressaceae 7

Juniperus
virginiana L.

* Collected from Wild Plants.

DICOTYLEDONES

Myricaceae 57

Myrica
*asplenifolia L.
*Gale L.

Leitneriaceae 59

Leitneria
floridana Chapm.

Fagaceae 62

Quercus
palustris L.

Ulmaceae 63

Platycarya
strobilacea Sieb. & Zucc.

Moraceae 64

Maclura
pomifera Schneid.

Ranunculaceae 91

Clematis
*virginiana L.

Lardizabalaceae 92

Akebia
quinata Decne.

Berberidaceae 93

Berberis
chinensis Poir.
Dielsiana Fedde

Lauraceae 102

Benzoin
aestivale Nees

Saxifragaceae 117

Deutzia
discolor Hemsl.
gracilis Sieb. & Zucc.
longifolia Franch.
magnifica Rehd.

Hydrangea
Bretschneideri Dipp.
cinerea Small
paniculata Sieb.
radiata Walt.

Itea
virginica L.

Philadelphus
cymosus var. Atlas Rehd.
Falconeri Sarg.
grandiflorus Willd.
mexicanus Schlecht.

Grossulariaceae 117b

Ribes
fasciculatum Sieb. & Zucc.
var. chinense Maxim.

Hamamelidaceae 123

Hamamelis
virginiana L.

Liquidambar
Styraciflua L.

Eucommiaceae 123b

Eucommia
ulmoides Oliv.

Platanaceae 124

Platanus
orientalis L. (true)

Rosaceae 126

Exochorda
Giraldii Hesse
Korolkowii Lav.
racemosa Rehd.

Physocarpus
glabratus Rehd.
intermedius Schneid.
monogynus Coult.
opulifolius Maxim.

* Collected from Wild Plants.

Rhodotypos
scandens Mak.

Rosa
alba L.
californica Cham. & Schlecht.
*carolina L.
multiflora cathayensis Rehd.

Rubus
allegheniensis Porter
odoratus L.

Sorbaria
sorbifolia A. Br.

Spiraea
Douglasii Hook.
Margaritae Zabel
trichocarpa Nakai
Veitchii Hemsl.
Wilsonii Duthie

Pomoideae 126a

Aronia
arbutifolia Ell.
*melanocarpa Ell.

Chaenomeles
Maulei Schneid.

Cotoneaster
divaricata Rehd. & Wils.
foveolata Rehd. & Wils.
lucida Schlecht.
montana Lge.
Zabeli Schneid.

Crataegus
Lavallei Herincq.
phaenopyrum Med.
Wendlandii Hort.

Malus
Scheideckeri Zabel

Mespilus
germanica L.

Pyracantha
Gibbsii A. B. Jacks

Sorbus
americana Marsh.
Aucuparia L.
commixta Hedl.
latifolia Pers.

Prunoideae 126b

Prunus
americana Marsh.
hortulana Bailey
*nigra Ait.
Padus L.
pennsylvanica L.
serotina Ehrh.
tomentosa Thunb.
*virginiana L.

Leguminosae 128

Cercis
canadensis L.

Colutea
media Willd.

Cladrastis
lutea K. Koch

Cytisus
nigricans L.
praecox Bean
scoparius Lk.
supinus L.

Gleditsia
triacanthos L.

Indigofera
Potaninii Craib.

Laburnum
anagyroides Medikus var. Alschingeri Schneid.

* Collected from Wild Plants.

Robinia
fertilis Ashe
Kelseyi (hybrid)
neo-mexicana Gray
viscosa Vent.

Sophora
japonica L.

Spartium
junceum L.

Wisteria
floribunda DC.

Rutaceae 137

Phellodendron
amurense Rupr.
japonicum Maxim.

Poncirus
trifoliata Raf.

Ptelea
serrata Small
trifoliata L.

Zanthoxylum
americanum Mill.
Bungei Planch.
schinifolium Sieb. & Zucc.

Euphorbiaceae 147

Securinega
ramiflora Muell.

Coriariaceae 150

Coriaria
japonica Gray

Anacardiaceae 153

Rhus
Cotinus L.
glabra L.
*typhina L.

* Collected from Wild Plants.

Cyrillaceae 154

Cyrilla
racemiflora L.

Aquifoliaceae 157

Ilex
glabra Gray
serrata Thunb.
serrata xanthocarpa Rehd.

Nemopanthus
mucronata Trel.

Celastraceae 158

Celastrus
orbiculatus Thunb.

Evonymus
Bungeana Maxim.
europaea L.
oxyphylla Miq.
patens Rehd.
yedoensis Koehne

Staphyleaceae 161

Staphylea
Bumalda DC.
colchica Stev.
colchica Coulombieri Zabel
pinnata L.
trifolia L.

Aceraceae 163

Acer
pseudoplatanus L.

Sapindaceae 165

Koelreuteria
paniculata Laxm.

Rhamnaceae 169

Rhamnus
davurica Pall.
Frangula L.

Vitaceae 170

Ampelopsis
brevipedunculata Koehne

Parthenocissus
quinquefolia Planch.

Theaceae 186

Stewartia
pentagyna L'Herit.

Guttiferae 187

Hypericum
densiflorum Pursh
patulum Thunb.

Tamaricaceae 191

Tamarix
pentandra Pall.

Stachyuraceae 200

Stachyurus
praecox Sieb. & Zucc.

Cactaceae 210

Opuntia
tortispina Engelm.

Elaeagnaceae 215

Elaeagnus
multiflora Thunb.
umbellata Thunb.

Araliaceae 227

Acanthopanax
divaricatus Seem.
setchuenensis Harms
Simoni Schneid.

Aralia
spinosa L.

Cornaceae 229

Cornus
alba L.
*alternifolia L.
Amomum Mill.
arnoldiana Rehd.
*canadensis L.
*florida L.
florida xanthocarpa Rehd.
kousa Buerg.
obliqua Raf.
racemosa Lam.
sanguinea L.

Clethraceae 230

Clethra
alnifolia L.

Ericaceae 233

Arctostaphylos
Uva-ursi Spreng.

Enkianthus
campanulatus Nichols.
cernuus Mak.
perulatus Schneid.

Erica
carnea L.

Kalmia
angustifolia L.

Lyonia
*ligustrina Britt.
mariana Rehd.

Oxydendron
arboreum DC.

Rhododendron
*canadense Torr.
maximum L.

Vacciniaceae 233a

Vaccinium
atrococcum Heller
canadense Kalm
pennsylvanicum Lam.

* Collected from Wild Plants.

Symplocaceae 241

Symplocos
paniculata Wall.

Styracaceae 242

Halesia
carolina L.

Styrax
japonica Sieb. & Zucc.

Oleaceae 243

Fontanesia
phillyreoides Labill.

Fraxinus
longicuspis Sieb. & Zucc.

Ligustrum
acuminatum Koehne var. macrocarpum Schneid.
obtusifolium Sieb. & Zucc.
sinense Lour.

Syringa
japonica Decne.
Josikaea Jacq.
pekinensis Rupr.
reflexa Schneid.
tomentella Bur. & Franch.

Loganiaceae 245

Buddleia
japonica Hemsl.

Verbenaceae 253

Callicarpa
Giraldiana Hesse
japonica Thunb.
longifolia Lam.

Clerodendron
trichotomum Thunb.

Solanaceae 256

Lycium
halimifolium Mill.
pallidum Miers

Rubiaceae 270

Cephalanthus
occidentalis L.

Caprifoliaceae 271

Diervilla
rivularis Gatt.

Kolkwitzia
amabilis Graebn.

Lonicera
demissa Rehd.
dioeca L.
Ferdinandi Franch.
Maackii Maxim.
muscaviensis Rehd.
prolifera Rehd.
quinquelocularis Hardw.
syringantha Maxim.
Webbiana Wall.
xylosteum L.

Sambucus
canadensis L.
pubens Michx.

Symphoricarpus
albus (L.) Blake (S. racemosus Michx.)
Chenaultii Rehd.

Viburnum
*acerifolium L.
alnifolium Marsh.
burejaeticum Reg. & Herd.
cassinoides L.
cotinifolium D. Don
dasyanthum Rehd.
*dentatum L.
dilatatum Thunb.
Lantana L.
*Lentago L.
lobophyllum Graebn.
molle Michx.
Opulus L.

* Collected from Wild Plants.

Opulus xanthocarpum
Endl.
pubescens var. affine Rehd.
rhytidophyllum Hemsl.
scabrellum Chapm.
Sieboldii Miq.
Wrightii Miq.

Weigela
florida Sieb. & Zucc. var.
variegata
japonica DC. var. sinica
Rehd.

SEEDS OF HERBACEOUS PLANTS

Aralia
*hispida Vent.

Arenaria
caroliniana Walt.

Arisaema
*triphyllum (L.) Schott

Aster
patens Ait.
spectabilis Ait.

Baptisia
tinctoria (L.) R. Br.

Cassia
Chamaecrista L.

Chelone
glabra L.

Chrysopsis
falcata (Pursh) Ell.

Cicuta
maculata L.

Cirsium
*lanceolatum (L.) Hill.

Clintonia
*borealis (Ait.) Raf.

Coptis
*trifolia (L.) Salisb.

Dodecatheon
Meadia L.

Eupatorium
perfoliatum L.
purpureum L.

Geranium
maculatum L.

Geum
canadense Jacq.
rivale L.

Helenium
autumnale L.

Helianthus
decapatalus L.

Hibiscus
Moscheutos L.

Hypericum
canadense L.

Iris
*versicolor L.

Liatris
scariosa Willd.

Lobelia
siphilitica L.

Lysimachia
terrestris (L.) BSP

Maianthemum
*canadense Desf.

Medeola
*virginiana L.

* Collected from Wild Plants.

Mitchella
*repens L.

Monarda
fistulosa L.

Oenothera
fruticosa L.

Potentilla
tridentata Ait.

Prunella
vulgaris L.

Pyrola
*rotundifolia Man.

Rhexia
virginica L.

Sagittaria
latifolia Willd.

Sanguisorba
canadensis L.

Scrophularia
marilandica L.

Sericocarpus
linariifolius (L.) BSP

Silene
stellata (L) Ait. f.

Sisyrinchium
angustifolium Mill.

Smilacina
*racemosa (L.) Desf.

Steironema
ciliatum (L.) Raf.

Tephrosia
virginiana (L.) Pers.

Thalictrum
*dioicum L.

Trillium
*undulatum Willd.

Vernonia
noveboracensis Willd.

Zizia
aurea (L.) Koch.
cordata (Walt.) DC.

Address requests for seeds **before March 1, 1939** to

SEED EXCHANGE,
Brooklyn Botanic Garden,
1000 Washington Avenue,
Brooklyn, N. Y., U. S. A.

* Collected from Wild Plants.

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GENERAL INFORMATION

Membership.—All persons who are interested in the objects and maintenance of the Brooklyn Botanic Garden are eligible to membership. Members enjoy special privileges. Annual Membership, $10 yearly; Sustaining Membership, $25 yearly; Life Membership, $500. Full information concerning membership may be had by addressing *The Director, Brooklyn Botanic Garden, 1000 Washington Avenue, Brooklyn, N. Y.* Telephone, Prospect 9-6173.

The Botanic Garden is open free to the public daily from 8 a.m. until dusk; on Sundays and Holidays it is open at 10 a.m.

Entrances.—On Flatbush Avenue, near Empire Boulevard and near Mt. Prospect Reservoir; on Washington Avenue, south of Eastern Parkway and near Empire Boulevard; on Eastern Parkway, west of the Museum Building.

The street entrance to the Laboratory Building is at 1000 Washington Avenue, opposite Crown Street.

To Assist Members and others in studying the collections the services of a docent may be obtained. This service is free of charge to *members of the Botanic Garden;* to others there is a charge of 50 cents per person. Arrangements must be made by application to the Curator of Public Instruction at least one day in advance. No parties of less than six adults will be conducted.

To Reach the Garden take Broadway (B.M.T.) Subway to Prospect Park Station; Interborough Subway to Eastern Parkway-Brooklyn Museum Station; Flatbush Avenue trolley to Empire Boulevard; Franklin Avenue, Lorimer Street, or Tompkins Avenue trolley to Washington Avenue; St. John's Place trolley to Sterling Place and Washington Avenue; Union Street or Vanderbilt Avenue trolley to Prospect Park Plaza and Union Street. By Automobile from points on Long Island take Eastern Parkway west and turn left at Washington Avenue; from Manhattan, take Manhattan Bridge, follow Flatbush Avenue Extension and Flatbush Avenue to Eastern Parkway, turn left following Parkway to Washington Avenue; then turn right.

BROOKLYN BOTANIC GARDEN PUBLICATIONS

RECORD. Established, January, 1912. An administrative periodical issued quarterly (1912–1928); bimonthly (1929–1932); quarterly (1933–). Contains, among other things, the *Annual Report* of the director and heads of departments, special reports, announcements of courses of instruction, seed list, guides, miscellaneous papers, and notes concerning Garden progress and events. Free to members of the Garden. To others $1.00 a year. Circulates in 59 countries.

MEMOIRS. Established, July, 1918. Published irregularly. Circulates in 47 countries.

Volume I. *Dedication Papers:* 33 scientific papers presented at the dedication of the laboratory building. 1917. 521 pages. $3.50, plus postage.

Volume II. The vegetation of Long Island. Part I, The vegetation of Montauk: A study of grassland and forest. By Norman Taylor, June 11, 1923. 108 pages. $1.00, plus postage.

Volume III. Vegetation of Mount Desert Island, Maine, and its environment. By Barrington Moore and Norman Taylor. 1927. 151 pages. $1.60.

CONTRIBUTIONS. Established, 1911. Papers originally published in periodicals, reissued as "separates" without change of paging. 25 numbers constitute one volume. 25 cents each, $5.00 a volume. Circulates in 34 countries.

No. 80. Inheritance of resistance to loose and covered smuts in Markton oat hybrids. 17 pages. 1938.

No. 81. Inheritance of resistance to loose and covered smuts in oat hybrids. 10 pages. 1937.

No. 82. Culture and inoculation studies on races of the loose and covered smuts of oats. 13 pages. 1938.

No. 83. Pteridophyta of the Galapagos and Cocos Islands. 31 pages. 1938.

No. 84. Influence of the growth of the host on oat smut development. 24 pages. 1938.

No. 86. The emergence of smut-inoculated oat seedlings through sand and loam soil. 7 pages. 1938.

LEAFLETS. Established, April 10, 1913. Published weekly or biweekly during April, May, June, September, and October. The purpose of the *Leaflets* is primarily to give announcements concerning flowering and other plant activities to be seen in the Garden near the date of issue, and to give popular, elementary information about plant life for teachers and others. Free to members of the Garden. To others, fifty cents a series. Single numbers 5 cents each. Circulates in 28 countries. Temporarily discontinued since 1936.

GUIDES to the collections, buildings, and grounds. Price based upon cost of publication. Issued as numbers of the RECORD; see above.

Guide No. 5. The Rock Garden. 28 illustrations. Price, 35 cents. By mail, 40 cents.

Guide No. 6. Japanese potted trees (Hachinoki). 11 illustrations. Price, 35 cents. By mail, 40 cents.

Guide No. 7. The story of our boulders: Glacial geology of the Brooklyn Botanic Garden. 22 illustrations. Price, 35 cents. By mail, 40 cents.

Guide No. 8. The story of fossil plants. 8 illustrations. Price, 35 cents. By mail, 40 cents.

SEED LIST. (*Delectus Seminum*) Established, December, 1914. Since 1925 issued each year in the January number of the RECORD. Circulation includes 160 botanic gardens and institutions located in 40 countries.

ECOLOGY. Established, January, 1920. Published quarterly in coöperation with the ECOLOGICAL SOCIETY OF AMERICA. Subscription, $4.00 a year. Circulates in 48 countries.

GENETICS. Established, January, 1916. Bimonthly. Subscription, $6.00 a year. Circulates in 37 countries.

BROOKLYN BOTANIC GARDEN RECORD

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CONTAINING THE

TWENTY-EIGHTH ANNUAL REPORT

OF THE

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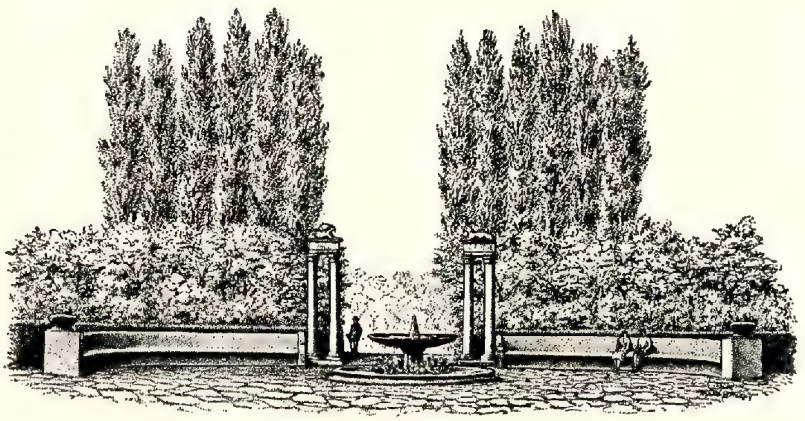
1938



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THE BOTANIC GARDEN AND THE CITY

THE BROOKLYN BOTANIC GARDEN, established in 1910, is a Department of the Brooklyn Institute of Arts and Sciences. It is supported in part by municipal appropriations, and in part by private funds, including income from endowment, membership dues, and special contributions. Its articulation with the City is through the Department of Parks.

The City owns the land devoted to Garden purposes, builds, lights, and heats the buildings, and keeps them in repair, and includes in its annual tax budget an appropriation for other items of maintenance. One third of the cost of the present buildings (about $300,000) and of other permanent improvements (about $253,000) has been met from private funds.

Appointments to all positions are made by the director of the Garden, with the approval of the Botanic Garden Governing Committee, and all authorized expenditures for maintenance are made in the name of the private organization, from funds advanced by the Institute, which, in turn, is reimbursed from time to time by the City, within the limits, and according to the terms of the annual Tax Budget appropriation.

All plants have been purchased with private funds since the Garden was established. In addition to this, it has been the practice of the Garden, from its beginning, to purchase all books for the library, all specimens for the herbarium, all lantern slides and photographic material, and numerous other items, and to pay certain salaries, with private funds.

The needs of the Garden for private funds for all purposes, are more than twice as great as the present income from endowment, membership dues, and special contributions. The director of the Garden will be glad to give full information as to possible uses of such funds to any who may be interested.

INFORMATION CONCERNING MEMBERSHIP

The Brooklyn Institute of Arts and Sciences is organized in three main departments: 1. The Department of Education. 2. The Museums. 3. The Botanic Garden.

Any of the following seven classes of membership may be taken out through the Botanic Garden:

1. Annual member	$ 10
2. Sustaining member	25
3. Life member	500
4. Permanent member	2,500
5. Donor	10,000
6. Patron	25,000
7. Benefactor	100,000

Sustaining members are annual members with full privileges in Departments one to three. Membership in classes two to seven carries full privileges in Departments one to three.

In addition to opportunities afforded to members of the Botanic Garden for public service through cooperating in its development, and helping to further its aims to advance and diffuse a knowledge and love of plants, to help preserve our native wild flowers, and to afford additional and much needed educational advantages in Brooklyn and Greater New York, members may also enjoy the privileges indicated on the following page.

Further information concerning membership may be had by addressing The Director, Brooklyn Botanic Garden, Brooklyn, N. Y., or by personal conference by appointment. Telephone, Prospect 9–6173.

Note: *Contributions to the Brooklyn Botanic Garden, through membership dues or otherwise, constitute proper deductions under the Federal Income Tax Law.*

PRIVILEGES OF MEMBERSHIP

1. Free admission to the buildings and grounds at all times.
2. Cards of admission for self and friends to all exhibitions and openings preceding the admission of the general public, and to receptions.
3. Services of docent (by appointment), for self and party (of not less than six), when visiting the Garden.
4. Admission of member and one guest to field trips and other scientific meetings under Garden auspices, at the Garden or elsewhere.
5. Free tuition in most courses of instruction; in other courses a liberal discount from the fee charged to non-members.
6. Invitations for self and friends to spring and fall "Flower Days," and to the Annual Spring Inspection.
7. Copies of Garden publications, as follows:
   a. RECORD (including the ANNUAL REPORT).
   b. GUIDES (to the Plantations and Collections).
   c. LEAFLETS (of popular information).
   d. CONTRIBUTIONS (on request. Technical papers).
8. Announcement Cards (Post Card Bulletins) concerning plants in flower and other items of interest.
9. Privileges of the Library and of the Herbarium.
10. Expert advice on the choice and care of ornamental trees, shrubs, and herbaceous plants, indoors and out; on planting the home grounds; the care of lawns; and the treatment of plants affected by insect and fungous pests.
11. Determination of botanical specimens.
12. Participation in the periodical distribution of surplus plant material and seeds, in accordance with special announcements sent to members from time to time.
13. Membership privileges in other botanic gardens and museums outside of Greater New York, when visiting other cities, and on presentation of membership card in Brooklyn Botanic Garden. (See the following page.)

FORMS OF BEQUEST TO THE BROOKLYN BOTANIC GARDEN

Form of Bequest for General Purposes

I hereby give, devise, and bequeath to The Brooklyn Institute of Arts and Sciences, Brooklyn, N. Y., the sum of.....Dollars, the income from which said sum to be used for the educational and scientific work of the Brooklyn Botanic Garden.

Form of Bequest for a Curatorship

I hereby give, devise, and bequeath to The Brooklyn Institute of Arts and Sciences, Brooklyn, N. Y., the sum of.....Dollars, as an endowment for a curatorship in the Brooklyn Botanic Garden, the income from which sum to be used each year towards the payment of the salary of a curator in said Botanic Garden, to be known as the (here may be inserted the name of the donor or other person) curatorship.

Form of Bequest for a Fellowship

I hereby give, devise, and bequeath to The Brooklyn Institute of Arts and Sciences, Brooklyn, N. Y., the sum of.....Dollars, the income from which sum to be used in the payment of a fellowship for advanced botanical investigation in the Brooklyn Botanic Garden, to be known as the .....fellowship.

Form of Bequest for other particular purposes designated by the testator

I hereby give, devise, and bequeath to The Brooklyn Institute of Arts and Sciences, Brooklyn, N. Y., the sum of.....Dollars, to be used (or the income from which to be used) for the Brooklyn Botanic Garden *

.....

.....

* The following additional purposes are suggested for which endowment is needed:

1. Botanical research.
2. Publishing the results of botanical investigations.
3. Popular botanical publication.
4. The endowment of a lectureship, or a lecture course.
5. Botanical illustrations for publications and lectures.
6. The purchase and collecting of plants.
7. The beautifying of the grounds.
8. The purchase of publications for the library.
9. Extending and enriching our work of public education.
10. The establishing of prizes to be awarded by the Brooklyn Botanic Garden for botanical research, or for superior excellence of botanical work in the High Schools of the City of New York.

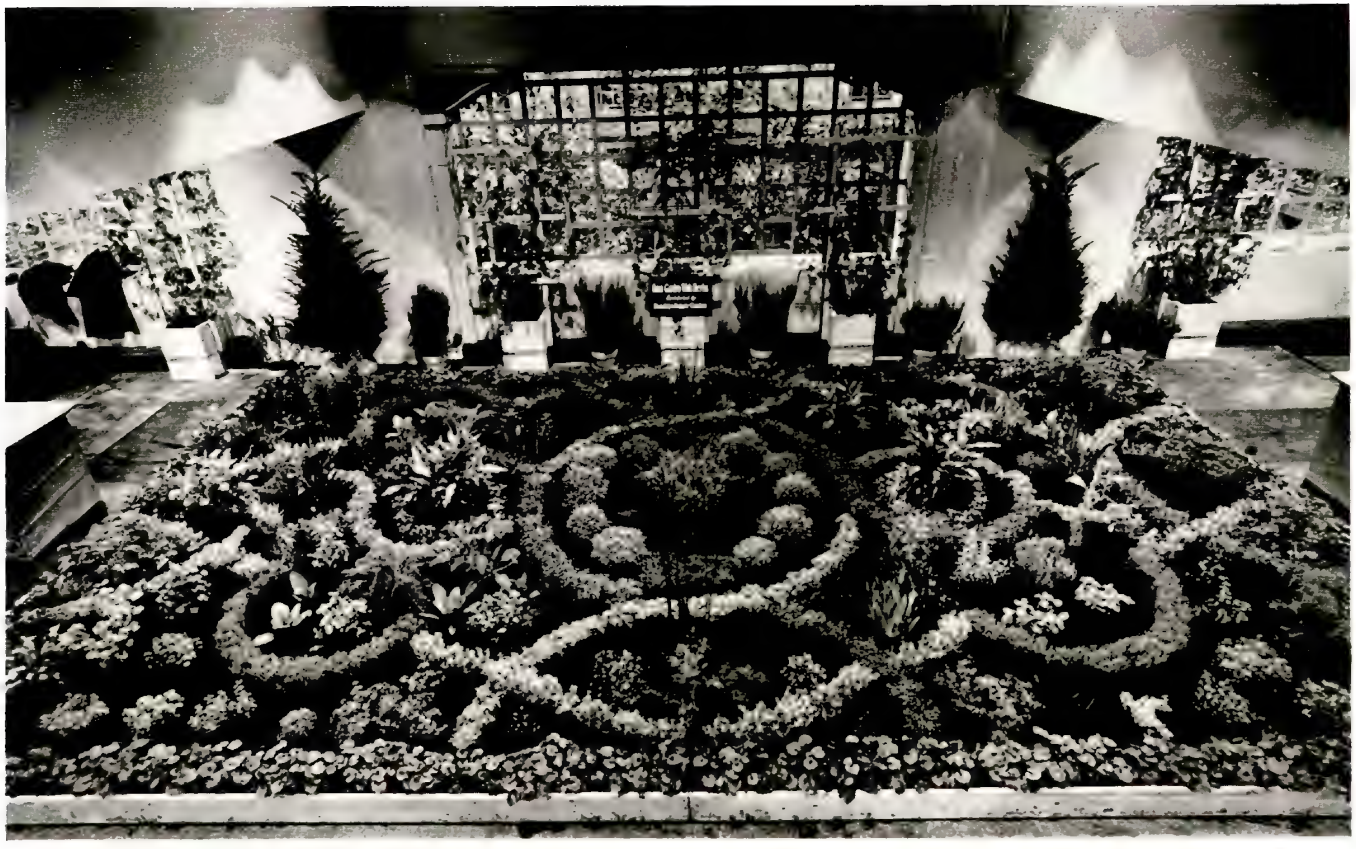

FIG 1. Knot Garden with Herbs. Exhibit at the International Flower Show, 1938. (9616)

BROOKLYN BOTANIC GARDEN RECORD

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TWENTY-EIGHTH ANNUAL REPORT OF THE BROOKLYN BOTANIC GARDEN 1938

REPORT OF THE DIRECTOR

To the Botanic Garden Governing Committee:

I have the honor to present herewith the Twenty-Eighth Annual Report of the Brooklyn Botanic Garden for the calendar year 1938.

Twenty-five Years of Elementary Education

On November 15, 17, and 19, exercises were held at the Botanic Garden to mark the twenty-fifth anniversary of the Department of Elementary Instruction and the appointment of Miss Ellen Eddy Shaw who, as instructor, beginning September 1, 1913, organized the work as a division of the Department of Public Instruction. The third annual report of the Garden, for 1913 (p. 43), records the fact that "The first course of instruction to be offered at the Garden by a member of the staff was on Indoor Plant Culture, given on five successive Wednesdays, beginning October 22." Forty-six persons registered for this course, which was given by Miss Shaw.

Under her efficient administration the work grew rapidly in extent and diversity. She became Assistant Curator of Public instruction on January 1, 1915, and on January 1, 1916, a separate Department of Elementary Instruction was created and Miss Shaw

was made curator and head of the new department, which now comprises a personnel of six persons on full time, and several persons giving part time to the work.

The activities of the department have fallen naturally into two categories—work with children of Elementary School and Junior High School age, and work with the teachers of children. The work with children has also naturally fallen under two heads—cooperation with schools, and work organized independently of the schools. The services which the Department has rendered to the City, through its schools and otherwise, during its first quarter century are summarized in the twenty-fifth annual report of Miss Shaw (pp. 76–85). Their chief value, of course, lies in their character and quality, of which the Botanic Garden has received abundant testimony from teachers, educational administrators, and others, and still more eloquent evidence from the rapid growth of the work. How great was the need of these services is reflected by the numerical statistics, which are truly impressive, especially if one keeps in mind the fact that the work has to do with only one comparatively small part of the elementary school curriculum, namely, nature study with plants.

The attendance at classes, lectures, and outdoor demonstrations in the plantations of the Garden has reached a maximum of about 110,000 a year, and the total for the twenty-five year period exceeds 1,500,000; the number of school classes that visit the Garden now exceeds 1000 a year; the number of talks and addresses given to schools, mothers clubs of public schools, and other educational organizations by the Curator averages 36 a year, with a maximum of 81 (in 1927), and with a total of 907 for twenty-five years. Many additional talks have been given by other members of the Department. The number of packets of vegetable and flower seeds supplied to children through the schools for planting in school and home gardens has reached more than 1,000,000 a year, with a total of more than 11,612,000 since 1914 when this work was inaugurated with a distribution of 25,000 packets. It should be kept in mind that the figures here given are for the Department of Elementary Instruction only, and not for the Botanic Garden as a whole.

In current museum terminology,[1] the number of "educational contacts" with children and adults through this department during its first quarter century has exceeded several million. But, as stated in a previous annual report, the work has been planned not merely for the purpose of disseminating information, which is the chief result of lecturing, but with a view to securing substantial educational results in addition to information, and without reference to rolling up impressive attendance figures. The work has therefore been characterized by small groups in classrooms and conferences, rather than by large audiences in the auditorium; it continuously involves intimate contact with the personality of the teacher, as is illustrated in figure 2.

The first formal recognition of Miss Shaw's twenty-fifth anniversary was a personal tribute paid by the School Garden Association of New York, in calling its annual luncheon, at the Hotel Pennsylvania, the "Ellen Eddy Shaw Luncheon." More than 1000 persons were present, including officials of the Board of Education, and the bronze medal of the Association was presented to Miss Shaw in recognition of her quarter century of service to the schools. The programs of the November meetings may be found on pages 81–83.

It is fitting to call attention here to the extent to which the work of the public schools and the lives of the children of this city would be impoverished without the services rendered by this Department. The work could have been extended and enriched far beyond its present status if the funds available had been more nearly adequate to the needs. A tribute to the leadership in this work will be found as Appendix 9, page 141.

Endowment for Elementary Instruction

The service which the Department of Elementary Instruction renders the schools, and otherwise to the boys and girls of the City, is largely financed from private funds. The total budget of the Department for 1938 was approximately $18,500. The ap-

[1] If, for example, a museum places an exhibit in a school having 5,000 pupils, the museum reports 5,000 "educational contacts." This, of course, is a purely statistical report; it takes no account whatever of the educational effectiveness of the "contact."

propriation in the Tax Budget for Personal Service was $3,319.68. The supplies used by this Department and provided for in the Tax Budget would bring the Tax Budget support for this extensive service to teachers and pupils to not more than $4,000, leaving the balance of $14,500 (nearly 79%) to be provided from Private Funds. For this the Department has been hitherto wholly dependent on fluctuating and inadequate income from contributions and other uncertain sources. The need of an endowment fund to place this work on an assured and permanent basis has long been recognized, and early in 1938 the Woman's Auxiliary undertook to raise a sum for initial endowment as a special tribute to Miss Shaw and the work of her Department. The amount secured, as of December 31, was $8,526.80. Of this total, $2,195.03 was the bequest of Miss Elin A. L. Wikander, a former student in some of our courses; the remainder, $6,331.77, came through subscriptions. It is hoped that this nucleus may grow to a substantial amount, more nearly commensurate with the importance of the work and the urgency of the need. The activities of the Department should be extended and enriched to meet the constantly increasing demands. Contributions to this endowment may be made at any time.

Public Instruction

"The love of nature," as Dr. Keppel has recently said, "and the desire to learn her secrets are widespread. They furnish potential sources of interest and motivation which are generally neglected by adult education as consciously practiced. The showing is better if we include the amateur gardeners . . . who do not realize that they are 'adultly' educating themselves at all. Generally speaking, however, nature is one of adult education's least developed natural resources."

But programs of adult education are largely arranged to meet, rather than to create, popular demand, and apparently more adults are interested in what *people* are doing, and in what they wish to do, than in what *nature* is doing, and so we find adult education courses in politics, economics, history, and other activities of men more popular than those dealing with animals, and especially with

FIG. 2. Class in gardening, illustrating intensive work with small groups. Instructor, Miss Shaw. (4474)

plants. All knowledge, of course, is useful in one way or another, and should be utilized.

> "Who learns and learns but does not
> what he knows
> "Is one who plows and plows but
> never sows."[1]

Moreover, the adults, quite generally, show most interest in information that may be used somewhat as a cook uses a book of recipes; hence the interest in nature of the "amateur gardeners" referred to above. Courses offered in practical horticulture have a relatively large enrollment; there is comparatively little interest in courses in the principles of botany that underlie horticultural practice and make it intelligent and not merely a blind following of instructions. The challenge to adult education, as indeed to all education, is to develop an interest in culture as well as in techniques.

Broadcasting has continued during 1938, both independently and in cooperation, for the seventh year, with the Radio Garden Club, conducted cooperatively by the Agricultural Extension Service of Rutgers University, from Station WOR. Two programs of 30 broadcasts by the Garden personnel were distributed to Botanic Garden members and others. The list of talks is given in Appendix 4 (p. 136). May was the busiest month the Radio Garden Club has had since its programs were initiated in January, 1932. A total of 1045 requests for digests and information were received from listeners in 23 states and the District of Columbia. The largest number of responses (415) was from New York State; the most distant states responding were California (42), Washington (3), and Oregon (2). Fifteen of the broadcasts were given in cooperation with the Municipal Station, WNYC; ten in cooperation with the Radio Garden Club (WOR); two over WMBG (Richmond, Va.); and one each over WMCA, WBBC, and WMNC (Asheville, N. C.). Mr. Free also acted as announcer for several programs.

The Radio Garden Club broadcasts will now have a world-wide audience thrice weekly as a result of arrangements completed in

[1] From the bookplate of James Phinney Baxter, Portland, Maine. Jour. Ex Libris Soc. **14**: 9. 1904.

December with Station WOR, Newark, New Jersey. Through the facilities of W2XJ1, WOR's new short wave radio station, the broadcasts may hereafter be heard in Hawaii, and in Europe, Africa, South America, and other foreign countries. This is in addition to the nation-wide coverage of the past two years through the facilities of the Mutual Broadcasting System. Station W2XJ1 operates on a frequency of 26.3 megacycles, with a power of 100 watts.

The September issue of the *National Seedsman* carries the following quotation from the chairman of the board of the Mutual Network: "In continuing the Radio Garden Club as a twice weekly highlight, WOR has done so with the conviction that it has proven of inestimable value to adult radio listeners." The bimonthly journal, *Horticulture,* the *Garden Digest,* and other garden publications have brought the Radio Garden Club to the attention of their readers.

Publicity and Publication.—During 1938 more than 35 news releases were sent at frequent intervals to the Associated Press, to all Metropolitan papers, and to the principal newspapers on Long Island, giving information about the Botanic Garden. Dr. Graves reports the receipt of more than 1000 clippings based on these releases and also of independent origin.

Eighty popular and semi-popular articles and reviews have been published during the year by members of the Garden personnel, in addition to ten technical publications. These publications are listed in Appendix 2, p. 123.

"Free" Education.—Some of the courses of instruction are given without any fee, especially to members as one of the membership privileges; for other courses there is a nominal charge to apply toward the cost of publicizing the courses, the correspondence involved, and especially the large quantities of living plant material and laboratory and other supplies used. Tuition is free —that is, to those who enroll. For, as a recent writer has well said, there is really no such thing as free education. Someone must pay for it. How often this is overlooked by the beneficiaries of "free" lectures and "free" courses of instruction. Part of the cost is met by the tax payers through the Tax Budget of the City, but a substantial portion of it is met by citizens who, in

addition to their taxes, make generous contributions for the support of our public educational institutions. It would be salutary if some way could be devised to make everyone conscious of this fact who visits our museums, zoological parks, and botanic gardens that are open "free" every day in the year, and who attends their lectures and classes without payment of any fee. Such an opportunity costs money. Someone pays for it.

Research

To an individual, research may be only the serious pursuit of a worth-while hobby, but to a nation research is a moral obligation. It is the very life blood of our museums and botanic gardens if they are to be more than mere show places and retailers of second-hand information. For a botanic garden, research not only serves a purpose which it serves everywhere and always—of enlarging the human mind, but it yields information which is indispensable for the efficient administration of its own collections of living plants, and which, in a still larger way, promotes a more intelligent and efficient agriculture and horticulture, which are fundamental to all other industry.

To some this may seem like an elaboration of the obvious, but experience shows that the fundamental necessity of research for educational institutions must be reiterated again and again so readily is it lost sight of. We must not forget that when governments, for example, find it necessary to reduce expenditure, as all governments do at times, it is the governmental research agencies that commonly suffer the first and most drastic reductions. There is the same tendency in educational institutions. While research has held its own with the other activities of the Botanic Garden during the general retrenchment made necessary by the great depression, we should not lose sight of the need of larger funds to establish the work more securely and on a scale more nearly commensurate with its importance. The income of $500,000 at 3.5 per cent. (the present average rate on invested funds) would yield $17,500.00—a truly modest sum, considering the need and importance of the work, for salaries, equipment, supplies, publication of the results of research, and other needs.

Reports of progress on research projects under way are given

on pages 47–65 following. During the year *Contributions* numbers 82–86 have been published embodying results of investigations by the Garden personnel.

The Library

The annual report of the librarian (pp. 104–108) records the accessions and activities for the year. Bibliographical and other services to readers steadily increase, as does also the number of readers. The number of volumes (20,543) and pamphlets (17,149), to a total of more than 37,600, has nearly reached the capacity of the shelving, and this is one of numerous reasons that make it urgent to begin now to plan for an extension to the Laboratory Building.

The librarian calls attention to the fact that binding still remains the greatest need of the library. This need increases each year by the receipt of current numbers of 1010 periodicals (the figure for 1938). The number of volumes loaned to other institutions was more than twice as great as the number borrowed, and the number of users (4,331) was 441 greater than a year ago—an increase of more than 11 per cent.

Among the rare items accessioned was *Das Entdekte Geheimniss der Natur im Bau und in der Befruchtung der Blumen* ("The secret of nature revealed with reference to the structure and pollination of flowers"), by Christian Konrad Sprengel. Berlin. 1793. This classic, only rarely offered in the trade, is one of the foundational works on the subject of the pollination of flowers by insects. The "secret" revealed was that "nature" apparently intended that no flower should be pollinated by its own pollen, and that the peculiar structures of flowers, hitherto a mystery to botanists, could be explained (and only so) by the relation of flowers to insects that visit them and so bring about cross-pollination. "Here," says Sachs, the historian of botany, "was the first attempt to explain the origin of organic forms from definite relations to their environment." It was Darwin who called the attention of the scientific world to the importance of Sprengel's almost forgotten work and its bearing on the rôle of natural selection in the origin of new forms of plant life. This "secret" which, in Sprengel's day, was a mystery to even the most learned

botanists, is now one of the commonplaces taught to "every schoolboy" in the nature study courses of our elementary schools.

The Herbarium

It is a pleasure to report the beginning of an endowment fund for the herbarium. Although a herbarium is indispensable to the work of a botanic garden, it does not appeal to the popular imagination like the beautification of the grounds, nor is it as readily or widely understood as, for example, a library; for this reason it is less apt to be the object of benefactions, except gifts of herbarium specimens by collectors.

The undesignated portion of the bequest of Miss Elin A. L. Wikander, $2,195.04, intended as a permanent fund to meet some urgent need of the Garden, has been set up as a nucleus to a Herbarium Endowment Fund, the income to be used exclusively for Herbarium purposes. It is a small beginning, but we hope the fund will be augmented at frequent intervals by other gifts and bequests for this important purpose.

Special attention is called to the appended report by Dr. Reed (pp. 94–96) on the Fungus Herbarium, listing some of the important items comprised in this collection.

The Plantations

The Dean Clay Osborne Memorial

One of the most important items to be recorded in this report is the generous gift by Mrs. Sade Elisabeth Osborne, Executrix, a member of the Board of Trustees, of the architectural features (fountain, water basins, seats, and columns) at the north and south ends of the Long Green in the Horticultural Section.[1]

[1] This section of the Botanic Garden, over three acres in area, lies between the Brooklyn Museum site on the east, and the new "Mt. Prospect Park" on the west. The area was one of two parcels of land on the south and east sides of Mt. Prospect Reservoir property, assigned to the Botanic Garden on September 9, 1912, and known until 1935 as the "North Addition" of the Garden. The original grade of this area, from the present line fence of Mt. Prospect Park eastward to the Brooklyn Museum line was about 23 feet above the sidewalk on Eastern Parkway. During 1914 the grade of the entire area was brought down to the level of the sidewalk, the

These features, of Indiana limestone (from Bedford, Indiana), were designed by our consulting landscape architect, Mr. Harold A. Caparn, whose perspectives in color were prepared some time ago as major features of the plan for the treatment of this area. For the north terminal Mr. Caparn associated with himself Mr. John Theodore Haneman, architect.

The Long Green, about 60 feet wide and more than 500 feet long, extends through the center of the Horticultural Section. It is approached from the south by a flight of 23 granite steps, and will be approached from the north through the gate or portal which has been designed for the Eastern Parkway entrance.

The features at the south end comprise a semicircular plaza paved with bluestone. At the south periphery of this plaza are two curved seats, with "coupled" columns at their inner or adjacent ends. These columns, 14 feet high, are similar to those in the Boboli Gardens, Florence. Near the north edge of the plaza is a water basin 17.5 feet in diameter, containing a fountain with pedestal and bowl. The contractor is authority for the statement that the stone (measuring 11 feet 3 inches by 5 feet 10 inches) from which the fountain bowl was carved was the widest piece of Indiana limestone ever brought to New York City.

The features at the north end also comprise a plaza, similar to that at the south end, with curved seats at the north edge. The monolithic dies at the inner ends of the seats carry beautifully carved urns. At the outer end of each seat is a fluted column 35 feet high. At the base of the fluted shafts are panels with carved leaves of the Ginkgo or "Maidenhair" tree, designed by Mr. Caparn. So far as we can ascertain, this is the first time the Ginkgo has been employed as a *motif* in this position, so commonly occupied in Roman architecture by the *fasces* or bundle of rods enclosing an axe—symbols of imperial authority. It was thought that for a botanic garden a design more symbolic of peace and the beauty of the plant world would be more suitable. Near

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excavated material being deposited in Prospect Park along Flatbush Avenue.

The history of the steps leading to the landscaping of this area, prior to Mrs. Osborne's gift, may be found in Brooklyn Botanic Garden *Record* for March, 1932, p. 28; April, 1933, p. 27; April, 1934, p. 20; April, 1935, p. 12; and April, 1936, p. 22.

FIG. 3. Water Basin, Seats, and Columns (35 feet high), north end of Long Green, Horticultural Section. Part of the Dean Clay Osborne Memorial. From Architect's Perspective in Color. (9738)

the south edge of the plaza is a water basin 16 feet in diameter, but containing no fountain.

The designs, after acceptance by the donor and by our Governing Committee, were approved by The Art Commission of the City.

The gift, a memorial to the late Mr. Dean Clay Osborne, of Brooklyn, deceased January 23, 1937, was reported to the Board of Trustees at its meeting on October 13, when a resolution of thanks to the donor was adopted with expression of the very great appreciation of the members of the Board.

Construction of the Memorial

The plaster models were done by Mr. John Donnelly, Jr., of the Donnelly Studios (John Donnelly, Inc.), Manhattan. The stone cutting was done in the yard of the contractor for the stone work, Nelson Brothers Company, of Long Island City. The carving began on August 5th, and the Ginkgo panels were carved by Mr. Rudolph Vogt. The contract for the foundations was executed by John Thatcher and Son, of Brooklyn, beginning September 8 and completed November 23.

The setting of the stone began October 18, and was suspended on December 15 on account of winter weather, after the setting at the south end had been completed, and the work at the north end completed all but the placing of the urns and the fluted columns. Other work remaining to be done includes the paving of the plazas at each end and the planting of the shrubbery which is, of course, an integral part of the design. The total cost of the work, when completed, will be in excess of $30,000.

Since the gift of the Rose Garden, by Mr. and Mrs. Walter V. Cranford, in 1927, and of the Rose Arc by Mrs. Cranford in 1936, no feature has been acquired which will add so much to the beauty of the grounds as this gift of Mrs. Osborne.

The entire development of the three acres of the Horticultural Section, subsequent to the initial lowering of the grade, has now been done without expense to the City, for the final grading and topsoiling, construction of wall garden and ten pergolas, and foundation planting were done as a project of the Federal Works Progress Administration (WPA) and its predecessor, the Civil Works Administration (CWA).

The Importance of Beauty in the Garden

"Nothing is right until it is beautiful." It is the purpose of a botanic garden to promote education in botany, and one of the branches of botany is ornamental horticulture, and, in particular, that aspect of it which concerns the utilization of plants to make a beautiful garden, or, to change the order of words, to make a garden beautiful. Botanic gardens in general place an emphasis on the natural *species* of plants; these vary widely in their decorative values. The Horticultural Section was planned to exhibit only horticultural varieties, and species which have value in landscaping. One may be an excellent botanist, but a very poor landscape architect. As long ago as 1878 there was published a book by W. Robinson on "The parks and gardens of Paris." In the preface the author wrote as follows:

"Here and there may be noticed in the book an impatience with the present condition of things as regards the direction of gardens by persons having no sympathy with the art. This is one of the causes why public gardens afford little pleasure or instruction compared with that of which they are capable. In Paris the direction of public gardens is frequently placed in the hands of botanists, engineers, and architects—hence stereotyped and very imperfect work. The plan and spirit of the old botanic garden is wholly wrong as a system, and from it there is no hope. . . . The leading idea in these gardens is that collections cannot be accumulated without arranging them in a hideous and depressing manner. . . . But improvements will probably never come through botanists . . ."!

It was in recognition of the essential truth, so frankly expressed in this quotation, that the Brooklyn Botanic Garden, at its very beginning, decided that the planning of its grounds should be done by the close association of landscape architect and botanist. No wiser decision concerning the Garden was ever made, and the appointment of Mr. Caparn took place in 1912. A recent Chicago publication has listed the Brooklyn Botanic Garden as one of the ten most beautiful public gardens in the United States, and the gift of Mrs. Osborne, here recorded, is a major contribution to its beauty.

The Washington Avenue Gates

The preceding annual report recorded the Sidney Maddock bequest of $10,000, "to be used to make some needed improvement in the Garden." No improvements have been more sorely needed for several years than suitable gates at our entrances. During the fall of 1915 entrance turnstiles and make-shift exit gates were installed with the definite anticipation that they were to serve only for a year or two at longest. These supposedly temporary devices, which have now served more than twenty years, became more and more unsuitable as attendance increased, and woefully inadequate when the attendance began to exceed 50,000 on a busy Sunday in spring—as many as 21,000 entrances at the Richard Young Gate alone, from noon on a Saturday to the closing hour the following Sunday afternoon (April 30–May 2). On some of the busy Sundays in May, 1937 and 1938, a double queue of visitors was maintained for two to three hours at the north Washington Avenue gate and at the Richard Young Gate, entailing no little inconvenience to the public. But it was not until 1929 that a suitable gate was made possible at the south Flatbush Avenue entrance by the generous gift of the late Hon. Richard Young.

And so it was decided that nothing could more fully carry out Mr. Maddock's generous wish to provide for "some needed improvement" than to use the bequest for gates at the two Washington Avenue entrances. McKim, Mead and White, who had designed more imposing structures for these entrances in 1930[1] made new plans for simpler structures that could be built at a cost within the amount of the bequest. In addition to the entrance and exit turnstiles (of the Perey type) and the supporting piers, there is a small booth just inside each gate to provide for vending guide books, souvenir postcards, and other objects; also for the storage of small garden tools used in the upkeep and in emergencies. These gates and booths now make it possible to service the public more properly at these points. The funds were sufficient for the construction of a third booth just inside the Richard Young gate. No bequest could have been more opportune. The construction work began on August 15 and was completed on December 21.

[1] Brooklyn Bot. Gard. Record for May, 1930.

The Eastern Parkway Gate

There are still two entrances that are little more than openings in the fence—the north Flatbush Avenue gate and the entrance at Eastern Parkway. A design for the portal at Eastern Parkway was prepared in 1930 by McKim, Mead and White, but funds for it have not yet become available. The urgency of the need for this gate can hardly be exaggerated. This is the main entrance to the Botanic Garden, and faces one of the most prominent and most used parkways in Brooklyn. It is not only needed for utilitarian purposes, but the architectural features at the north end of the Long Green, presented by Mrs. Osborne, are predicated upon the construction of this portal.

The design provides for a structure of architectural dignity and scale suitable for the main entrance of a public institution like the Botanic Garden, and in harmony with the imposing Brooklyn Museum building adjacent on the east. In addition to entrance and exit turnstiles, there are two rooms to serve for the storage of garden implements, the vending of publications, and the shelter and comfort of visitors. This gate is the last major item in the initial physical development of the grounds. It would not only meet an urgent need of the Botanic Garden, but would also, from its architectural value, be an important civic improvement. The cost will approximate $60,000.

Burning of the Shinto Shrine

While members of the Woman's Auxiliary and of the Garden, and their friends, were attending the lecture-luncheon by Mrs. Constance Spry, at the Waldorf-Astoria Hotel, on Tuesday, January 25, the Inari Shrine in the Japanese Garden was completely destroyed by fire. Comment on the fire, on the editorial page of the *Herald-Tribune* of January 30, included the following: "If . . . the fire was a deliberate anti-Japanese demonstration instead of one of accidental origin, the incident is doubly regrettable." The facts are as follows: There had been a series of several prevailingly rainy days before the day of the fire. There had been rain during the forenoon of that day, and it was raining when the fire broke out. The outside of the Shrine was thoroughly wet.

When the flames were first seen they were coming from *within* the Shrine, before any of the outside was on fire. The fire started about fifteen to twenty minutes after the guard on duty at the Japanese Garden had gone to his lunch, leaving the Garden unprotected, as usual, during his lunch hour. On account of the inclement weather, there were almost no visitors in the Botanic Garden that day, and fewest of all at the lunch hour. The structure, built of California redwood and put together without nails, except for the shingles on the roof, was completely destroyed, and the two "sacred" stone foxes, "messengers of the god," imported from Japan and standing on either side of the entrance, were cracked and ruined by the heat. That the fire may have started accidentally from flying sparks is untenable, for no rubbish or anything else had been burned in the Botanic Garden for several weeks. In accordance with Japanese custom, Miss Averill, honorary curator of the Japanese Garden, has had a cairn of small roundish stones erected on the site of the Shrine. The fire destroyed a beautiful bit of exotic architecture, unique in America; it will require approximately $2000 to restore it, and the act brought only expressions of universal condemnation. Beyond these results the fire accomplished exactly nothing.

An editorial in the *Herald-Tribune* the day after the fire commented as follows: "Because many good people are now strenuously objecting to the barbarity of Japanese militarism, New Yorkers are to be denied enjoyment of an example of that delicate craftsmanship and high artistic feeling which are equally a product of the Japanese spirit . . . the smouldering little ruin in the Brooklyn Botanic Garden must be added to the gutted temples of China as another score for the blind and brute savagery of war. It is supposed to be the militarism against which current anti-Japanese feeling is directed, not the Japanese. But how in Heaven's name can one oppose what appear to be the bad elements in a national genius by indiscriminate reprisal against the great positive gifts which it has brought to the world? There may be grounds for opposing Japan's militarists by wrecking her militarism; but to do it by wrecking her art, her civilization, her many valuable contributions to our common life is to reduce one's self to the militarists' level and below."

The Hurricane

The Hurricane of September 21, which was a major calamity, in destruction of life and property, for Long Island and the larger part of New England, was the most severe on record for the area affected. The following meteorological data have been kindly supplied by Dr. James H. Kimball, meteorologist-in-charge, at the U. S. Weather Bureau Observatory, Whitehall Building, New York.

"The wind as recorded at the Whitehall Building between 3:37 and 3:42 p.m., September 21, 1938, was 70 miles per hour from the northwest, and in one minute of this interval it reached 80 miles per hour, probably there were gusts 5 to 10 miles higher.

"At Floyd Bennett Field [about five miles south of the Botanic Garden] the Coast Guard reported that the wind velocity indicator went up to 90 miles per hour, the limit of its capacity; while at the Weather Bureau Station [also at the Field] gusts were ascertained to be 110 miles per hour or more.

"Gusts of 90 miles per hour were also recorded at the station on the *Daily News* building, and estimated to be 110 miles per hour on the Empire State Building."

The worst loss at the Botanic Garden was in the hedge of Lombardy Poplars (*Populus nigra* var. *italica*), extending somewhat northeast by southwest, along the Washington Avenue border of the Experimental Garden, and planted nineteen years ago (in 1919). A continuation of the hedge southward, in a line more nearly north and south, along the edges of the Children's Garden, suffered only slight damage and will not have to be replaced. All the trees suffered more because they still had most of their foliage.

Among other losses were the Willows along the Brook, one of which was blown down, others injured by loss of branches; a Plane Tree (*Platanus*), more than 40 years old, on Boulder Hill, blown down; a Locust (*Robinia*) east of the Conservatories; Willows in the Japanese Garden. One of the latter trees, in falling, knocked over the "Waiting Pavilion" (*Machi-ai*) on the west shore of the Lake; another broke down a section of the Japanese fence about 50 feet long. About 55 trees in all were felled by the wind. (See, also, p. 101.)

All the work of clearing away the fallen trees and cleaning up the debris scattered by the wind had to be done by our small force of men at the expense of routine fall work, as the Garden had no funds to hire extra help. To replace the structures destroyed and the trees with younger specimens will require in excess of $1000.

The New Herb Garden

The new garden of medicinal and culinary herbs was formally opened on the afternoon of September 27. A delightful talk on "Culinary Herbs" was given by Mrs. Hollis Webster, of Lexington, Mass., a member of our national committee organized to select plants for the Culinary Garden, as reported in our preceding Annual Report. A very interesting talk on "The Importance of Medicinal Herbs in Modern Medicine" was given by Dr. Frederick Schroeder, of the Long Island College of Medicine, who served as Chairman of our National Committee to select the plants for the Medicinal Garden. Inspection of the Herb Garden followed the program in the Auditorium. An exhibit of old herbals and modern publications on herbs was arranged in the library, and tea was served by the Woman's Auxiliary. A twelve-page *Leaflet* on the Herb Garden was distributed to those in attendance, and to all members of the Botanic Garden.

The plants in this garden were chosen by two advisory committees, as follows:

Advisory Committee on Medicinal Plants. Dr. Frederick Schroeder, Chairman, representing Long Island College of Medicine and Kings County Medical Society; Dr. Charles W. Ballard, College of Pharmacy of Columbia University; Dr. Ralph H. Cheney, Brooklyn Botanic Garden and Brooklyn College of Pharmacy; Dr. William Mansfield, Albany College of Pharmacy of Union University; Dr. Erwin E. Nelson, United States Department of Agriculture; Mr. F. W. Nitardy, representing E. R. Squibb & Sons, New York; Dr. George B. Wallace, New York Academy of Medicine; Dr. Frederick J. Wulling, College of Pharmacy of the University of Minnesota.

Advisory Committee on Culinary Plants. Mrs. Helen Morgenthau Fox, Chairman, representing the Horticultural Society of

New York; Mrs. Jay Clark, Jr., Woman's National Farm and Garden Association; Mrs. Charles Doscher, Federated Garden Clubs of New York State; Mrs. Alfred Kay, Garden Club of America; Mrs. Hollis Webster, The Herb Society of America.

The Brooklyn Botanic Garden is under very great obligations to the members of these two committees for their interest and cooperation.

Attendance

The "Guide-Book to the General Contents of the British Museum," published in 1761, states that "fifteen persons are allowed to see it in one Company, the Time allotted is two Hours; and when any Number not exceeding fifteen are inclined to see it, they must send a List of their Christian and Sirnames, Additions, and Places of Abode, to the Porter's Lodge, in order to their being entered in the Book; in a few Days the respective Tickets will be made out, specifying the Day and Hour in which they are to come, which, on being sent for, are delivered. If by any Accident any of the Parties are prevented from coming, it is proper they send their Ticket back to the Lodge, as nobody can be admitted with it but themselves. It is to be remarked that the fewer Names there are in a List, the sooner they are likely to be admitted to see it." Only eight parties of not more than fifteen each could be admitted in one day.[1] In other words, the attendance of visitors was strictly limited to not more than 120 a day. The attendance at the Botanic Garden from noon April 30 to 5 p.m. Sunday, May 1, with Garden open 12 hours, was 155 every two minutes—a total of 56,145.

The above regulations could hardly be said to encourage one to be "inclined to see it," and they emphasize a point of view diametrically opposed to that which prevails among museum administrators today, when every possible effort is made to increase attendance at exhibits and lectures. Of course the more that enter the more are "exposed" to education and culture, and it is the function of a botanic garden or other museum to stimulate and promote interest as well as to gratify it.

[1] Coddington, K. de B. The making of museums. *The 19th Century and After*. April, 1936.

With an annual attendance of more than 1,628,000, as in 1938, it has ceased to be necessary for the Garden to stimulate attendance; our main concern now is to care properly for such large numbers of people—as they enter the gates, while they are here, and as they leave—and to see to it that the plantations are so beautiful and otherwise so instructive that every visitor will wish to come again and again.

Cooperation

Hortus, Inc.

The preceding annual report recorded the part played by the Garden in initiating the movement for a Horticultural Section in the New York World's Fair, 1939. The preliminary steps culminated on February 3, when a meeting was held at the Hotel Lexington, Manhattan, and a group of those interested was organized as Hortus, Inc. A constitution was adopted and the following officers were elected: President, Mrs. Harold Irving Pratt. Vice Presidents, Dr. C. Stuart Gager, Brooklyn Botanic Garden; Dr. William J. Robbins, New York Botanical Garden; Mr. Charles H. Totty, former President of New York Florists Club; Executive Vice President and General Manager, Mr. Augustus M. Dauernheim, former President, Society of American Florists; Treasurer, Mr. James C. Auchincloss, Horticultural Society of New York; Secretary, Mr. William A. Rodman; Comptroller, Mr. Kelsey Matthews; Publicity Director, Mr. B. H. Goldenson. Plans for the Horticultural Exhibit at the Fair have been progressing during the year, including the exhibits of the Brooklyn Botanic Garden which, in addition to its horticultural exhibits, has been asked by the City authorities to prepare an exhibit for the New York City building; and by the New York State authorities an exhibit in the Long Island Section of the New York State Building. To meet the cost of installing the entire Horticultural Exhibit at the Fair the sum of $235,000 was underwritten during the year. The Brooklyn Botanic Garden's share of this was $10,000, which was underwritten as follows: Philip A. Benson, Edward C. Blum, Mrs. Mary Childs Draper, William T. Hunter, Alfred E. Mudge, Mrs. Dean C. Osborne, Frederick B. Pratt, and Mrs. Frederick B. Pratt, $1000 each; Henry J.

Davenport, Hilda Loines, Mrs. Stephen Loines, Edwin P. Maynard, $500 each.

"Gardens on Parade" is the designation chosen for the Hortus Exhibit, and the "cornerstone" of the pavilion in this section was laid, with appropriate exercises on the site, on Friday afternoon, October 21, representatives of the Botanic Garden being present.

Department of Parks

1. *Mt. Prospect Park.*—Ever since the land comprising the Botanic Garden was "granted and devised" by the City of New York to The Brooklyn Institute of Arts and Sciences to administer as a botanic garden (Agreement of December 28, 1909), an area of several acres at the northwest corner of the Garden has been occupied by Mt. Prospect Reservoir. This area has an east frontage on the Botanic Garden of approximately 637 feet, and a north frontage on Eastern Parkway of some 575 feet. About 1929 there began an organized effort to induce the Board of Estimate and Apportionment to approve the Mt. Prospect property as the site for the Brooklyn Center of the College of the City of New York. This Center was later organized as Brooklyn College. About 1934 the Board of Higher Education, fortunately, requested the Board of Estimate to approve a larger property in south Flatbush, known as "the Wood-Harmon site," for the location of the new College. On December 21, 1934, this site was approved and subsequently purchased by the City, much to the gratification of the Botanic Garden authorities, who felt that if a large college (it now, December, 1938, has an enrollment of 13,440 students at day and evening sessions, not including 3,519 in the summer session) were located adjacent to the Garden our grounds would inevitably become transformed by use into the campus of the college, especially since the Reservoir site was so small as to leave very little area after the buildings were erected. In fact it was definitely proposed at one time that some of the Botanic Garden land be taken and added to the proposed site of the college.

On January 3, 1935, the Commissioner of Parks, Mr. Robert Moses, requested the Commissioner of Water Supply, Gas, and Electricity, Mr. Maurice P. Davidson, to release the Mt. Prospect Reservoir property to the Commissioners of the Sinking Fund, for transfer to the Department of Parks.

On April 16, 1936, the Commissioner of Water Supply notified the Commissioner of Parks that, as soon as the reservoir should be abandoned as a part of the water supply system of the City, he would release the property to the Commissioners of the Sinking Fund.

It was finally decided by the Park Commissioner to develop the Mt. Prospect Reservoir tract as "Mt. Prospect Park," with a playground for children on the north side. In order to secure an approach to Mr. Prospect Park from Eastern Parkway by ramp, rather than by steps, the Park Department, in July, 1937, asked the Botanic Garden authorities for their approval of plans that included, among other features, the location of our proposed gate or portal at the Eastern Parkway entrance approximately 44 feet back from the street. After conferences on the site (in August, 1937) and further correspondence, the director of the Garden was authorized by the Botanic Garden Governing Committee to notify the Park Department that the Committee approved in general the plans of August 24, 1937, submitted by the Department, but that it was the unanimous judgment of the Garden authorities "that there should be no gateways or gates, or any provision at any point for passing directly from Mt. Prospect Park into the Botanic Garden." It was decided that the work should proceed on the basis of the plans as originally submitted to us, including a flight of stone steps leading down the embankment from the gate near the southeast corner of Mt. Prospect Park. Our letters to the Park Department on this matter contained the following statements:

"In acting on this matter the Governing Committee recognized that, by the terms of our *Agreement* of December 28, 1909, with the City of New York, we are not free to alter the present boundaries of the Garden, nor to turn over any of the area. In approving the proposed plan, therefore, the Committee understands that it is merely deciding to locate its Eastern Parkway entrance south of the sidewalk for a distance to be agreed upon, and authorizes the Park Department to landscape the area between the gate line and the street so as to give a treatment that will blend in properly with the Museum frontage on the east, and also provide the kind of approach you desire to Mt. Prospect Park on the west."

(*Letter of August 20, 1937, to Mr. William H. Latham, Acting General Superintendent, Department of Parks.*)

". . . our Governing Committee wish it to be mutually understood that, in consenting to the development and subsequent maintenance by the Department of Parks of the area under discussion, outside of our entrance gate and north boundary fence, the Board of Trustees of the Brooklyn Institute of Arts and Sciences does not relinquish any of this area, which was assigned to our Board for Botanic Garden purposes in our *Agreement* with the Board of Estimate and Apportionment of December 28, 1909, and subsequent amendments; our assent is merely to the proposal that our entrance be located approximately forty-four (44) feet back from the street, and that the Park Department develop the area in accordance with your plan above referred to, and assume entire responsibility for the maintenance of the area extending across our entire Eastern Parkway frontage from the street curbing back to our entrance gate and the fence extending east and west of it." (*Letter of September 29, 1937, to Mr. Allyn R. Jennings, General Superintendent, Department of Parks.*)

The Reservoir property was turned over to the Commissioners of the Sinking Fund and thence, on to the Department of Parks. On Monday, February 28, 1938, several hundred Works Progress Administration men, under the auspices of the Department of Parks, began the work of demolishing the reservoir basin and grading the area for park purposes. The work was still under way at the close of the year. The water-testing laboratory of the Water Department, which has stood some forty years or more on the Flatbush Avenue frontage of the Reservoir land, will be transferred to the new laboratory building which is being constructed on Underhill Avenue.

Board of Education

Details of our services to, and cooperation with, the elementary and high schools of the City are given in the appended reports of the Curators of Public Instruction and of Elementary Instruction, and need not be repeated here. The work could be extended and enriched if funds were available for development along clearly indicated lines.

Board of Higher Education

As previously reported, the Botanic Garden has offered each year, since 1935, a scholarship in our Saturday field classes as an award for superior work in the Biology Department of Brooklyn College. The scholar for the spring of 1938 was Mr. Sol Kriminetsky, who enrolled in course A9, Trees and Shrubs of Greater New York.

Works Progress Administration

Indoor Workers.—During the year WPA indoor workers continued substantially as in 1937, except that the number has been reduced from 32 at the end of 1937 to 23 at the end of 1938. Some of the assignments were discontinued at our request. The largest number under assignment at any one time in 1938 was 29, as against a maximum of 54 in 1937. In the Progress Report signed by the Garden as of December 31, 1938, the Project was identified by Official Project Number 465–97–3; Service or Job Number 69. The average weekly payroll for the year, met by the WPA, was $603.50, as against the average of $1067.14 for 1937.

Outdoor Workers.—In last year's report we recorded the removal, by the close of 1937, of all outdoor workers (guards, technicians, handymen). The guards were removed for the stated reason that these are "budgetary" positions—i.e., positions of a continuing nature which should therefore be provided for in the annual budget of the Garden.

Police Department

An appropriation for guards at the gates was requested in the Tax Budget Estimate for the year, but was not granted, and so the entrances were without the supervision of guards throughout the year, except on Sundays and holidays, when men were assigned to the gates from the regular per diem force. This, of course, necessitated time off during the week since no funds were available for overtime. As a result, there was an increase of petty vandalism, the convenience and pleasure of those visiting the Garden for serious purposes was interfered with, and numerous complaints were received from visitors, by letter, by telephone, and in person. It is a pleasure to record here our appreciation of

the continuing cooperation of Captain Bernard C. Downs and his men of the 74th Precinct.

A guard at each of our entrances, on continuous duty whenever the grounds are open to the public, is one of our most urgent needs. The Police Department has assigned patrolmen, and plain clothes men, but whenever there is a public event (a parade, a welcoming of "heroes," etc.) requiring a large additional force of patrolmen, in Brooklyn or Manhattan, the Botanic Garden is left with only one police officer (sometimes none) to cover 50 acres at times when protection is most needed. When the attendance is small, guards and policemen are needed chiefly to look after the gardens, for vandalism is doubly easy when no one is looking; the Shrine in the Japanese Garden was burned on one of the days of smallest attendance. When the crowds are large, guards and policemen are needed to look after both the gardens and the people.

Experience clearly shows that most of our vandalism would be stopped at its source if we had guards at our gates at all times when the Garden is open to the public.

National Youth Administration

During 1938, we had four girls working for both the librarian and the custodian: one worked for four months (May to August), 156 hours; one two days in June, 14 hours; two 14 months (June through December), 596 hours—a total of 766 hours. On the plantations, under supervision of the horticulturist, there were 32 young men, who worked a total of 9872 hours. On the basis of an eight-hour day, the total for both groups (10,638 hours) is approximately 1330 days.

Horticultural Society of New York

At the annual meeting of the Board of Directors of the Horticultural Society of New York, on January 12, Dr. Gager was re-elected a member for the customary term of three years. Mr. Richardson Wright was re-elected chairman, and Dr. Gager was elected to the newly created office of vice-chairman of the Board.

Miscellaneous Cooperation

The International Flower Show was held at the Grand Central Palace, March 14–19. The twelfth[1] consecutive exhibit of the Garden—an Elizabethan Knot Garden, planned and installed by Mr. Montague Free—is described by Mr. Free in his appended report of the horticulturist. The exhibit was awarded a silver medal, a special prize, and a certificate of appreciation. There was a crowd in front of the exhibit almost constantly throughout the entire week of the Show. Brooklyn Botanic Garden *Leaflet*, Series XXV, No. 1, describing knot gardens, and our exhibit in particular, was distributed gratis. Dr. Gager served for the seventh year on the committee of judges for other exhibits.

Garden Clubs.—Forty-three Garden Clubs and other organizations, with a total attendance of more than 5800, have held meetings at the Garden, frequently having the services of a docent. Where overtime or other special expense is incurred in connection with these meetings a charge is made sufficient to reimburse the Garden.

The New York City Committee for Public Adult Education was organized during June. The purpose of this Committee "is to plan the Public Adult Education Program that will be instituted in the City of New York in the future, and to take any steps necessary to put this program into operation." Dr. Gager was appointed to membership on the Committee on June 24. The executive chairman is Mr. Norman T. Sobel.

Committee of One Hundred for the Completion of the Brooklyn Central Library.—The officers of this Committee include the following members of our Board of Trustees: Mr. James H. Post (subsequently deceased), first chairman; Mrs. William H. Good, vice-chairman; Miss Mary E. Dillon, secretary. Dr. Gager was a member of the Committee. Work on the completion of the building, our near neighbor, was well under way at the close of the year.

Bird Lovers Club of Brooklyn.—The bird life of a botanic garden is important because of the relation of birds to plant life, both directly (e.g., dissemination of pollen, spores, and seeds) and

[1] Our first exhibit was in 1918; the second in 1927, since when we have exhibited annually.

indirectly through their relation to insects both beneficial and injurious to plant life. Aside from this, birds are a part of the natural environment of plants and are of absorbing interest to many visitors to any garden. For several years the Botanic Garden has cooperated with the Bird Lovers Club of Brooklyn by posting on each of its five bulletin boards, at frequent intervals, lists of birds that frequent the Garden at the given season. *Bird Notes,* published by the Club, contained in its issue for December, 1937, a "Preliminary List of the Birds of the Brooklyn Botanic Garden." The list includes 90 species, including the Dovekie, or "Little Auk" (*Alle alle*), observed in November, 1932, and the Blue Tanager (*Thraupis cana*), which made its home in the Garden during the fall of 1937. Eleven of the species listed nest in the Garden. The absence of automobiles and of dogs off leash are favorable to birds, and every effort is made to encourage them, by the exclusion of cats as far as possible, and otherwise. The quiet and protected Local Flora Section is a specially favored rendezvous of both migrating and year-'round birds.

National Recreation Association publishes monthly, at New York, the magazine *Recreation.* Miss Shaw served as "guest editor" for the March, 1938, issue. In addition to an editorial, she contributed an illustrated article on "Children's Work at the Brooklyn Botanic Garden."

Miss Frances M. Miner, instructor, was on leave of absence without pay from October 1, 1937, to October 1, 1938, for the purpose of making a survey of children's gardening for the National Recreation Association, which is considering the possibility of inaugurating children's gardens as a part of their work.

At the North American Outdoor Life Show, held in Baltimore on February 12, Dr. Gager served with former Governor Robinson, of Delaware, Senator Wolcott, of Connecticut, and others on the Committee of Judges for the Wild Flower Exhibit.

The Garden Center at Greenwich Village (New York City) opened January 31, under the auspices of the Little Gardens Club. The Botanic Garden has cooperated for some time with the Club. In early spring we supplied a quantity of our *Leaflets* for the Garden Center Library.

The Westbury Horticultural Society and members of the *Na-*

tional Association of Gardeners as guests of the Society, visited the Garden February 17.

The Interboro Boys Center is an "education-recreation" unit of the Bureau of Attendance of the Board of Education, with about 2000 boys enrolled. In response to a request in May, we sent them a quantity of flower and vegetable seeds from our Penny Packet project. Their letter of thanks states that this "will enable many a boy to spend hours of enjoyment out-of-doors."

The Flatbush Chamber of Commerce members, with their wives, met at the Garden by invitation on Wednesday afternoon, May 11. After a tour of the grounds tea was served in the main floor rotunda.

The U. S. Department of Immigration and Naturalization, with quarters on Ellis Island, were supplied in October with 24 palms and other greenhouse plants in large sizes to be used for decorative purposes. The District Commissioner is Mr. Rudolph Reimer, of Brooklyn.

Cooperation with Four Hospitals, in the instruction of Nurses Training Classes, is recorded in the appended report of the Department of Public Instruction (p. 68).

In October Mr. Free visited the *Brooklyn Thoracic Hospital* and made suggestions for planting the grounds. Also, in October a visit was made to the *Creedmoor State Hospital,* Queens Village, Long Island, to examine and report on cultural and pathological troubles with evergreens growing on the grounds. Cooperation with the School Art League of New York is recorded in the report of Dr. Graves (p. 76).

A Second Twenty-fifth Anniversary

The Botanic Garden *Record* for January, 1914 (pp. 18 and 24) refers to the fact that, "On September 17–20, 1913, the Botanic Garden staff moved from the temporary quarters occupied since the fall of 1910, in the Central Museum, to the first section of the new laboratory building in the Garden. During the past three years the work of developing the Garden has assumed such proportions that this first section was entirely outgrown before it was occupied, and the need for the second section is urgent."

"On Saturday afternoon, December 13, 1913, the President

[Mr. A. Augustus Healy] and Trustees of the Brooklyn Institute of Arts and Sciences, the Committee on Botanic Garden [Mr. Alfred T. White, Chairman], and the Director and Staff of the Garden received the members of the Department of Botany of the Institute and their friends at the opening of the first section of the new laboratory building and conservatories." Mrs. Lewis H. Pounds, wife of the then President of the Borough of Brooklyn, presided "at the coffee urn," and about two hundred guests were present, including Borough President Pounds. This event was recalled by the Brooklyn *Daily Eagle* in their issue of December 13, 1938, in the column "25 years ago in Brooklyn."

Woman's Auxiliary

The annual report of the field secretary (p. 110) summarizes the activities of the Woman's Auxiliary, including the lecture-luncheon and lecture-tea on Flower Decoration, January 25 and 28, by Mrs. Constance Spry, of London; the teas at the Spring Inspection and flower days; and the programs and receptions in connection with the twenty-fifth anniversary of the Department of Elementary Instruction. The talks by Mrs. Spry resulted in widespread and favorable publicity, some 80 notices appearing in newspapers of twelve states, from Maine to Wisconsin and south to Georgia and Louisiana. The proceeds of these lectures have been contributed by the Auxiliary to the Ellen Eddy Shaw Endowment for the Department of Elementary Instruction.

Twenty-fourth Annual Spring Inspection

The twenty-fourth annual Spring Inspection was held as usual on the second Tuesday of May, which came this year on May tenth. The keynote of the Inspection was the work of the Department of Elementary Instruction, celebrating its twenty-fifth anniversary this year. The Itinerary of the tour of the grounds included the Children's Building and Garden, and the exhibits in the Laboratory Building were planned to illustrate the work of that department, as follows: (1) Work with boys and girls in leisure time; (2) Work with teachers' extension classes in co-operation with the New York City Board of Education; (3) Il-

lustrations of work with visiting classes from public and private schools; (4) Boys' and Girls' Club Room, Children's Library, and other educational equipment; (5) Educational greenhouses for children and adults. The weather in the afternoon was ideal, but threatening weather during the forenoon may have operated to somewhat reduce the attendance, which was estimated at about 500.

Personnel

Mr. Edward C. Blum, who has been president of the Brooklyn Institute of Arts and Sciences for ten years (May, 1928–1938) was, on April 14, 1938, elected to the newly created office of Chairman of the Board of Trustees.

Mr. James G. McDonald was elected president of the Brooklyn Institute of Arts and Sciences at the meeting of the Board on April 14, 1938, succeeding Mr. Blum. For some time the duties of this office have become gradually more onerous and too time-consuming to be discharged by the voluntary services of an otherwise busy man, and so it was decided to make the presidency a salaried office to be filled by a full-time incumbent. Mr. McDonald, the first president under the new arrangement, has had a wide experience in administration. After graduating from the University of Indiana in 1909, he did graduate work there and in Harvard University, and in 1915 he traveled in Spain and France as Woodbury Lowery traveling fellow of Harvard. From 1919 to 1933, he served as the first chairman of the Foreign Policy Association. His other offices include vice-presidency of the National Council for the Prevention of War, membership in the executive committee of the National Commission on American-Japanese Relations, membership in the Commission on International Justice and Good-Will of the Federal Council of Churches, membership in the advisory council of the League of Nations Association. Just previous to coming to the Brooklyn Institute, he was League of Nations High Commissioner for Refugees, and a member of the editorial staff of the New York *Times.*

Mr. David H. Lanman, who became a member of the Botanic Garden Governing Committee on March 19, 1937, resigned from the Board of Trustees on October 13, 1938, thus terminating his membership on the Governing Committee.

Miss Frances E. Miner, instructor, who was granted a year's leave of absence, beginning October 1, 1937, for the purpose of making a survey of children's gardening for the National Recreation Association, returned to her position at the Garden on October 1.

Mrs. Whitney Merrill's appointment as Field Secretary terminated as of July 31, on which date the position was abolished. Mrs. Merrill's work began on January 1, 1932, as secretary of the Membership Committee of the Woman's Auxiliary. She continued as an officer of the Auxiliary until July 1, 1933, when she became a regular member of the Botanic Garden personnel as Field Secretary.

Membership

"In the old days it was sufficient, in the case of many private philanthropies, to have the confidence of a relatively small group of wealthy and socially prominent patrons. This is still vitally important. But today private philanthropies simply cannot exist without the support of the givers of small amounts. . . . In the future, as large fortunes are divided and subdivided through taxation, the support of those of moderate means will assume even greater importance." [1]

Nothing could be more certain, and membership in our museums and botanic gardens affords an attractive and efficient method for those of smaller as well as of larger means to give such institutions both moral and financial support. Recognizing the inevitable result of the present method and intent of taxation, a trustee of one of our older universities has raised the question: "How shall we survive the coming millennium of equalitarian destitution?" There is no obvious complete answer, but the plan of membership in our botanic gardens and museums is a very satisfactory partial answer for them, provided enough persons respond to the opportunity. But the plan will remain hopelessly inadequate so long as the best known methods of promoting membership result in only about 500 members for an institution having an annual attendance of more than 1,628,000 in a city of nearly 3,000,000 population. Such are the figures for the Brooklyn Bo-

[1] John Crosby Brown. Private giving and public spending. *Atlantic Monthly.* June, 1938. p. 316.

tanic Garden at the close of 1938. The population of Brooklyn is greater than any of thirty-one States. Unquestionably, ten times as many citizens could afford membership, and would perhaps do so if they could be made to realize how vitally important such an institution as the Botanic Garden is to the welfare of the community of which it and they are a part.

Services to Members

Among the numerous privileges of membership in the Garden, listed on page iii at the front of this Report, is participation in the periodical distribution of surplus plant material and seeds to members only. In his appended report (p. 101) the horticulturist records that during 1938 members were supplied with 644 packages of seeds, and in April 3,240 plants were distributed to 216 members.

Another membership privilege is the giving of expert advice on all aspects of plant life. On April 4 Mr. Tilley, in charge of the Rose Garden, gave instruction on the pruning of roses, with practical demonstration in the Rose Garden, to more than 30 members who came in response to our special announcement to members.

Memberships were, until very recently, urged chiefly as a means of securing special privileges and advantages for the member. While membership retains this aspect, we believe it should be more generally urged as also a civic responsibility.

School Memberships

It is a pleasure to record the beginning of memberships by schools. The Biology Department of James Madison High School, Brooklyn, was the first enrollment, but our neighbor across the street, the Girls Commercial High School, takes the lead in numbers, having taken out five memberships during 1938. In addition, last April the class of June, 1940, of this school (class teacher, Miss Helen M. Buckley), also took out an annual membership as an expression of their pleasure in passing through the Garden daily on their way to and from school.

Membership in the Garden affords an excellent opportunity for schools to record their appreciation of the extensive services which the Garden renders to pupils and teachers. It would also have a

wholesome educational effect by emphasizing to the pupils the importance of recognizing some civic responsibility and obligation on their part in return for the advantages they enjoy as pupils in our free schools.

Contributions and Gifts

The largest gift of the year was the architectural embellishment of the Horticultural Section by Mrs. Dean C. Osborne, Executrix, reported in detail on pages 18–22.

A list of 265 gifts and of contributions of funds begins on page 116. These have all been acknowledged with the thanks of the Botanic Garden Governing Committee of the Trustees.

The director is often asked how much is contributed each year to the support of the Garden by private citizens. Items are listed on page 44 showing cash contributions during 1938 in excess of $54,000. But if a cash value were assigned to the gifts of living plants, books, scientific specimens, association items, equipment, supplies, and services received each year the annual total, in terms of dollars, would be considerably increased. The gift of a rare plant or book may enrich our collections far in excess of any financial value that might be assigned to it; the number of contributors is also important, as well as the value of the gifts.

Financial

The Taxing of Knowledge and Education

The two motive forces of educational institutions are ideals and financial support. Neither is truly effective without the other. That such institutions have made some progress during the past nine years is due in large measure to the pulling force of ideals, for during this period of economic stress and social and political upset, funds that would normally have been contributed to their support have either not been earned or have been largely required to meet the mounting burden of taxation. It is a pleasing fiction that churches and educational and eleemosynary institutions are not taxed, for when contributions to annual maintenance are reduced by twenty-five per cent or more, as is the case with the Brooklyn Botanic Garden since 1929, owing in large part to

new and increased taxes, the institution itself is taxed, however indirect may be the method. And this tax is, of necessity, passed on to the employees of the institution, in reduced compensation, and in reduced expenditures for educational activities. Since 1929 the Garden has closed every year with a balanced budget, but this has been possible only by reducing all expenditures, including wages and salaries, in harmony with an annual budget that has decreased from $228,867.00 in 1930 to $184,820.09 [1] in 1938, with a low for the period of $155,456.00 in 1933.

The need of more nearly adequate financial support has never been more serious than now. As a rule, people contribute only to those institutions in which they have confidence, and confidence is based on accomplishments which are indications of ideals and efficiency of administration. People have, from the beginning, given generously to the Brooklyn Botanic Garden, for its own sake and from civic interest. A compelling reason for contributing to the Garden is because it affords an effective channel for contributing to the most urgent needs of civilization, namely, the advancement of knowledge and education and civic betterment.

Public and Private Funds, 1938

The total operating budget for the year 1938 was as follows, with comparison for 1937:

	1937	*1938*	*Change*
Tax Budget	$ 89,457.75	$ 96,125.20	$ 6,667.45 Inc.
Private Funds	90,066.71	123,694.89	33,628.18 Inc.
Totals	$179,524.46	$219,820.09	$40,295.63 Inc.

For the past eight years the percentages of the two budgets have been as follows:

	1931	*1932*	*1933*	*1934*	*1935*	*1936*	*1937*	*1938*
Tax Budget	48%	50%	47.2%	49.2%	48.3%	49.1%	49.8%	43.73%
Private Funds	52%	50%	52.8%	50.8%	51.7%	50.9%	50.2%	56.27%

[1] Exclusive of bequests and gifts totaling $35,000 for permanent improvements.

The 1938 Tax Budget appropriation was $4,977.74 less than requested, as follows:

	Requested	*Granted*	*Difference*
Personal Service	$ 83,729.94	$81,125.20	$2,604.74
Other Codes	17,373.00	15,000.00	2,373.00
Totals	$101,102.94	$96,125.20	$4,977.74

The appropriation for per diem wages, $17,500, is specified as for "Not to exceed 20 men at not to exceed $5.00 a day." Twenty men, at $5.00 a day, is $100 a day. On that basis $17,500 would carry 14 men for 29 weeks, or only from January 1 to July 22. For several years we have not had less than 14 men, and this force has not been adequate to give proper maintenance to an intensively cultivated garden of 50 acres, especially since we must give time off during the week on account of overtime for guard duty on Sundays and holidays. No funds are provided for guards which are, of course, absolutely indispensable. In order to retain the men throughout the year we can pay only $4.00. This involves an injustice that has too long continued, especially when men in the Department of Parks, doing the same kind of work as our men, are receiving $5.50 a day.

Private Funds Contributed, 1938

Citizens of Brooklyn have contributed to the Garden during 1938 more than $54,000, as follows:

For permanent improvements	$35,000.00
For endowment	10,721.84
For the Collections Fund	3,537.74
For memberships	4,543.13
Miscellaneous (through Woman's Auxiliary, etc.), more than	200.00
Total	$54,002.71

In other words, in addition to income from endowment and other private funds sources, private citizens have contributed during the year an amount equal to nearly 57 per cent. of the Tax Budget appropriation—a substantial testimony to public interest in the Garden.

The City and the Garden

The advantages to the City of its partnership with private boards of administration in the conduct of its public museums and botanic gardens are typically illustrated in the contributions above listed.

The Permanent Improvements ($35,000) are on city-owned land and become the property of New York City. In all probability, none of these gifts would have materialized if the Garden area had been developed merely as a park administered by the City.

The Endowment Gift, of $10,721, is chiefly to enrich the activities of the Department of Elementary Instruction which has charge of our extensive work for the children of the public schools. As stated earlier in this report, nearly 79 per cent. of the budget of this department is provided from private funds.

The Collections Fund ($3,537) is used chiefly to purchase plants, books for the library, herbarium specimens, and other items essential to the conduct of the Botanic Garden. We are wholly dependent on private funds for these purposes, and the library and other collections are open free daily to the public.

The Membership Dues ($4,543) are also used for the library, the purchase of plants, the publication of the Annual Report (required by the City), announcements of public lectures and courses of instruction, and other purposes from which the public benefits.

Capital Outlay Budget

It is twenty-five years since the first section of our Laboratory Building was occupied, and twenty years since the remainder of the completed building was occupied. During these periods there have been only minor repairs and replacements to the heating system (pipe lines and radiators) and the plumbing, in both the building and the conservatories.

The water is supplied from the artesian wells of the old village of Flatbush water company, and is very hard. Owing to this fact, the water pipes have become so clogged that one cannot see through a section of pipe held to the light, and water passes through very slowly, and under such reduced pressure that it has become impossible to throw a stream from the hose in the plant

houses sufficiently high to reach the foliage of the taller plants in the large house. The steam lines have also reached the point where renewal of the entire system is urgent. We have not been able to use some of the coils in the Conservatories for a year or more.

The acoustics of the corridors, rotundas, and rooms of the Laboratory Building have been distressing from the beginning. Our request to the Director of the Budget for appropriations in the Capital Outlay Budget of the City was submitted August 30, and included the following items, which were approved in the Capital Budget for the year 1939, adopted by the Board of Estimate on December 2, 1938.

Project PV6, Code No. COB. C 36.—Reconstruction of plumbing and fixtures in Laboratory Building and Conservatories, $5,280.00. " COB " in the Code number indicates the project had an adoption in the 1938 Capital Outlay Budget, but has had no authorized appropriation prior to October 14, 1938.

Project No. PV10.—New heating system, $9,000.00.

Project No. PV11.—Treatment of corridors and rooms with acoustic tile, $3,000.00.

These are among the projects for which appropriations are authorized to be made under the New York City Charter, without condition.

It is anticipated that these repairs and replacements will be made during the summer of 1939.

Need of Additional Income

The development of the physical plant has proceeded steadily since 1911. Two major items of permanent improvement are yet to be provided for, namely, the construction of a portal or gate at the Eastern Parkway entrance (approximately $60,000.00) and the enlargement of the Laboratory Building (approximately $175,000.00). The building has now become quite inadequate for our needs.

Additional funds for maintenance, and for the programs of research and public education, were never more urgently needed than now. The amount available each year for the maintenance and enrichment of the collection of living plants is wholly in-

adequate; unbound material is steadily increasing in the library; there are no funds primarily for publishing the results of research; the publication of our very popular *Leaflets* has been reduced from ten or twelve numbers a year to three or four; the *Record* has been reduced from a bimonthly to a quarterly; only nominal amounts are available for field work, and the purchase of laboratory and herbarium equipment and supplies. At our present interest rate of 3.5 per cent. on permanent funds, the income on $1,000,000 would barely provide for the falling off of private funds income since the world depression began, about 1930; and yet our need for additional funds, resulting from the normal, healthy growth of a young institution and the increased use of the Garden and demands for service by the public, increases each year.

A plan of retiring allowances or pensions is still an unfulfilled but urgent need. As early as 1927, I presented a plan, prepared in cooperation with the Carnegie Foundation for the Advancement of Teaching, and showed how the Botanic Garden's share of the annual premium payments might have been financed with funds then in hand. This is one of the important financial matters that should have early attention.

Said Professor William Graham Sumner, of Yale University, one of the founders of sociology in America, "Discontent . . . is an agency which produces achievement and drives on what we call progress." We are appropriately discontented.

Respectfully submitted,

C. Stuart Gager,
Director.

REPORTS ON RESEARCH FOR 1938

Plant Pathology

By George M. Reed

Studies on the Inheritance of Resistance of Oat Hybrids to Loose and Covered Smuts

Second generation plants of additional oat hybrids were grown during the past year. The hybrid of Green Mountain X Monarch is particularly interesting because it makes possible a study of the

inheritance of smut resistance, using new specialized races of the covered smut. Both parents are susceptible to the Missouri race of the covered smut, one parent, Monarch, being resistant to the Missouri race of loose smut. The new specialized race of covered smut behaves in exactly the opposite fashion to the loose smut. With the Missouri race of covered smut, 100 per cent. of the inoculated second generation plants were infected. On the other hand, of the sets of second generation plants inoculated with the other two smuts, approximately 25 per cent. were infected.

Data were obtained on new hybrids involving Gothland and Monarch, varieties which behave in an opposite fashion toward the Missouri races of loose and covered smuts. With the present hybrids, a somewhat higher percentage of infection of the second generation plants inoculated with the loose smut was secured, while with the covered smut approximately 25 per cent. were infected.

Interesting new hybrids involve the very resistant variety Navarro, which has been crossed with Hull-less, Black Mesdag and Gothland. Interesting data on the behavior of the second generation plants inoculated with various races of smuts have been secured.

A large number of uninoculated second generation plants of all these hybrids have been grown, thus providing seed for a large series of third generation progenies. These will be grown during 1939 and, on the basis of their reaction, further light on the inheritance of the smut-resistant quality may be obtained.

Physiologic Races of the Oat Smuts

Additional experiments were carried out with some of the collections of both loose and covered smuts of oats in order to determine the extent of their physiologic specialization. During the past few years about 30 collections of covered smut and about 60 collections of loose smut, obtained from many different regions, have been used in experiments in order to determine their specialization. Many races of both species of smuts have been clearly defined.

Studies on Experimentally Produced Physiologic Races of the Oat Smuts

Dr. L. Gordon Utter has continued his infection studies with 13 new races which resulted from his hybridization experiments between the loose and covered smuts of oats. These races were selected on the basis of their symptoms, morphology and pathogenicity on differential host varieties over a four year period. Eight races of the covered smut and 5 of the loose smut were obtained on Gothland, Rossman, Monarch Selection, Seizure and Monarch oat varieties. The covered smut types gave a range of infection up to 100 per cent. on Gothland and other varieties. Monarch showed full resistance to all but one race, and then with only 40 per cent. infection. Infections with the loose smut races ranged from 63 to 100 per cent. on Monarch, while Gothland was fully resistant to three races. Both Monarch and Gothland were 100 per cent. infected by one race. Since Gothland is normally resistant to the covered smut but susceptible to the loose smut, and Monarch is resistant to the loose smut but susceptible to the covered, the new races selected show recombinations for symptoms, morphology and pathogenicity which make them distinctive.

Smut spores from these races were used to inoculate the varieties cited and also Early Champion, during the past season. The results generally indicated that the same degree of infection was maintained by these races toward Monarch and Gothland. Further, identical percentages of smut were frequently obtained on the same variety from which the race was selected. A few races, however, showed either higher or lower infections.

Tests were also made with smut collections from other oat varieties which occurred in the same original series with the selected new races. The object was to determine whether such collections corresponded in infection behavior to the designated race from a given series. The results indicated that slight to decided differences in infection of the oat varieties occurred with these collections and in only one instance was the percentage of smut comparable with that of the race.

The variability of smut percentages shown by the collections would suggest that they are still undergoing segregation for pathogenicity since their symptoms and morphology remain un-

changed. Further inoculation tests would be necessary to establish them as permanent new types. However, the continued and generally constant infection behavior, symptoms and morphology of the 13 new smut races add to their probable acceptance as new types and indicate the role hybridization may play in the production of new races.

Sorghum Smut Investigations

Dr. D. Elizabeth Marcy has made further studies on the effect of conditions of seedling germination on the infection of sorghum with the covered kernel smut. In the spring of 1938 tests were made to determine whether the size of the sand particles in which the seeds were germinated would affect the infection of the seedlings. Dakota Amber Sorgo, a highly susceptible variety, was used. One set of inoculated seeds was germinated in sand which had passed through a 20-mesh sieve but not through a 40-mesh. Another set was germinated in sand which had passed through a 60-mesh sieve. The comparison was made at three different temperatures, 17.5, 22.5 and 27.5° C. and at five different degrees of moisture supplied as water and as a 2 per cent. sucrose solution. When the seedlings were sufficiently advanced they were transplanted to the field and at maturity the percentage of infected plants in the various series was determined.

Seedlings germinated in fine sand at 17.5 and 22.5° C. gave a higher percentage of infected plants than those germinated in coarse sand under 12 out of 14 different combinations of seedling environal conditions. It is probable that the two exceptions were due to some experimental error. When the germination temperature was maintained at 27.5° C., the percentages of infection were lower when the seedlings were germinated in the fine sand as compared with those germinated in coarse sand in all but one case, in which the percentage of infection was practically the same.

This entire experiment was repeated with one important modification. The paraffin paper cups in which the seeds were planted were sealed with waxed paper and paraffin, thus preventing any exchange of gases between the contents of the cups and the outer air. The percentage of infected plants from the sealed cups was then compared with the percentage of those from the non-sealed

cups. The results were inconclusive for the susceptible variety, Dakota Amber Sorgo. A comparison of the infection results when the seedlings were germinated in coarse and fine sand in sealed cups showed practically the same relationship as just reported for the non-sealed cups.

Interesting results were obtained with the semi-resistant variety, Feterita, which was subjected to a limited number of similar tests at 22.5° C. Under favorable conditions for infection, plants of Feterita may produce blasted heads, a condition known to be the result of infection. A somewhat higher percentage of blasted plants of Feterita was obtained from seedlings germinated in the fine sand in most cases. In another series, seedlings were also germinated in sealed and non-sealed cups in coarse sand only. At 17.5° C. a higher percentage of blasted plants was obtained from seedlings germinated in non-sealed cups, while at 22.5 and 27.5° C. a considerably higher percentage of blasted plants was obtained from the seedlings germinated in the sealed cups when the sand was moistened with water. However, when the sand was moistened with a 2 per cent. sucrose solution, the results were somewhat variable.

From these experiments it has been concluded that rather slight differences in the conditions under which inoculated seeds are germinated may determine whether or not a plant will become infected.

These tests with the covered smut were repeated on the highly resistant Dwarf Yellow Milo, and in no case did any infected plants occur. This variety was also inoculated with spores of the loose kernel smut, and the seeds germinated in coarse and fine sand and in sealed and non-sealed cups, no infection taking place in any experiment.

The Iris

By George M. Reed

Iris Plantations

In cooperation with Mr. Montague Free, Horticulturist, extensive replantings of the bearded iris were made. It is several years since there has been any change in the location of these varieties. Several of the old beds have been abandoned and new ones utilized.

Soft Rot of the Iris Rhizome

The soft rot of the iris rhizome has continued to be very destructive to the bearded iris, a large number of plants in the experimental field being destroyed during the growing season. The disease appeared in early June, becoming particularly destructive in late July and August. Dr. L. Gordon Utter carried out many experiments during the season with a view to obtaining possible methods of control. As yet, no satisfactory methods of soil treatment have been found. Many varieties were saved by the procedure of digging them up in early June soon after flowering and resetting them in a new area. Dr. Utter has undertaken a special study of the cultural characteristics of the bacterium which causes this disease, and further experiments on control will be undertaken.

Iris Thrips

Since 1933, experiments in cooperation with the Division of Truck Crop and Garden Insect Investigations, Bureau of Entomology and Plant Quarantine, Washington, D. C., have been carried out for the control of the iris thrips, an insect particularly injurious to the Japanese iris. The experimental work has been carried on by Dr. L. Gordon Utter of the Botanic Garden and Dr. C. A. Weigel and Dr. Floyd F. Smith of the Bureau of Entomology. Of particular interest are the results obtained with the insecticidal tests for the control of the pest. Fumigations with calcium cyanide, carbon bisulphide and naphthalene flakes killed few thrips and injured the iris foliage. Nicotine (12.5 per cent.) powder fumigation (2 oz. to 1000 cu. ft.) for one hour gave high control with slight foliage injury. Certain sprays proved slightly to moderately effective: Paris Green and several arsenate compounds with brown sugar, thiuram disulphide, phenothiazine, tartar emetic-brown sugar, and a commercial extract of derris root and other substances. Severe iris foliage injury resulted with the arsenates. Derris powder (.0202–.025 per cent. rotenone) with sulphonated castor oil (1–400) or SS (sodium oleyl sulphate with synthetic resinous base) and 40 per cent. nicotine sulphate (1–400) with SS or soap flakes (1–200) as spreaders gave 98 to practically 100 per cent. thrips reduction. The results usually have been based on eight weekly pre-flowering applications but

almost identical control resulted with four bi-weekly sprays. Application of the first four weekly sprays gave 81 to 90 per cent. reduction, while the last four sprays showed 96 to 97 per cent. Eight weekly sprays with the derris reduced (.0101 per cent. rotenone) gave control equal to the standard (.0202 per cent.) while 40 per cent. nicotine sulphate (1–800) showed thrips reduction of 94 per cent. Effective control has been demonstrated with derris and nicotine sulphate under large-scale applications. Complete eradication has not been effected with any of the treatments tested.

Farmingdale Iris Garden

This garden, established in cooperation with the State Institute of Applied Agriculture on Long Island, showed excellent results during the past year. Of special interest were the Japanese iris. A very large number of varieties of this group have been planted, and made an excellent display. Many additional plantings were made in the Propagation Section, particularly with a proposed exhibit of the Japanese iris at the Worlds Fair in view.

Iris Hybridization

In recent years a large number of hybrids between various so-called " species " of Southern iris have been made. Of particular interest are the crosses involving the very tall, blue flowered *Iris giganticaerulea* and the unique colored *I. fulva.* Several first generation plants involving these two species bloomed this year and provided material for self-pollination, as well as additional combinations. The special interest in these hybrids will appear when the second generation plants come into bloom. Miss Charlotte Beier, a graduate of Brooklyn College, volunteered her services from February to September. She looked after the iris pollination work in the greenhouse as well as in the field. The seeds which resulted were cared for and planted and we now have a large number of interesting seedlings coming along for further study.

Graduate Students Enrolled During 1938

Mr. Paul F. Brandwein, a graduate student of New York University, has continued his studies. An interesting paper on

FIG. 4. Japanese-American (*Castanea crenata* × *C. dentata*) chestnut hybrid (H86–31). This tree was a nut in 1931 and is, therefore, now (October 2, 1938) at the end of its 7th season of growth. Height 24 feet; diameter at

the emergence of smut-inoculated oat seedlings through sand and loam soil has been published.

Mr. Bernard A. Friedman, a graduate student in New York University, has enrolled for the research course in plant pathology. He has undertaken a study of the soft rot of Witloof chicory. This plant product is imported in considerable quantities from Belgium and, frequently, parts of the shipments are more or less injured by a soft rot. The bacterial organism causing it is closely related, at least, to the one which causes the soft rot of the iris.

Chestnut Breeding Work in 1938

By Arthur Harmount Graves

The aim of this project is to develop, by breeding, a type of chestnut tree suitable for replacing the now practically extinct American chestnut, *Castanea dentata.* Since this species has been virtually wiped out through the attack of the parasitic fungus, *Endothia parasitica,* the new chestnut must be resistant to the attacks of this fungus; and since the American chestnut was a timber tree, the new chestnut must also be of a type suitable for timber. In 1930 we began crossing the American species with the Japanese, the latter being more or less resistant to the fungus, but unfortunately a comparatively low-growing tree and therefore not suitable for timber. Since then we have also made many hybrids of the American and the Chinese species, the latter being the most resistant of all the species that are growing on our plantations; but, again, a tree of small stature. As fast as we can we are continuing the breeding of all our types in successive generations.

There are at least three main specifications indicated for the new chestnut type: (1) Disease resistance; (2) Tall, erect form; (3) Vigorous (rapid) growth. I am pleased to be able to report that we already have the second and third characters and part of the first (see fig. 4). To develop a type of greater blight resistance, two or three more generations (perhaps 10 years) may

base, 6.5 inches. The man is 6 feet tall. This hybrid shows the form suitable for producing timber. It has been little pruned; the habit is therefore natural. Being somewhat susceptible to the blight (as shown by inoculation tests) it is being crossed with very resistant Chinese individuals.

be required. This year we have made a special effort to increase the blight resistance of our Japanese-American hybrids by crossing them again with our most resistant Japanese and Chinese individuals. We have continued our method of testing each individual by inoculating it with the blight.

Assistance and Cooperation of Institutions and Individuals.—The cordial interest and real assistance offered by many individuals and institutions have been indeed encouraging. For the third year in succession we were awarded a grant-in-aid from the National Academy of Sciences, through the National Research Council at Washington, D. C. In addition, the Division of Forest Pathology of the U. S. D. A. helped us financially during the summer. Through the continued cooperation of the Northeastern Forest Experiment Station at New Haven, Conn., Mr. C. Edward Behre, Director, we were given the services of a young forester, Mr. Ed Mish, of the Yale School of Forestry, during the flowering season of the chestnuts, in June and July.

On December 30, 1938, we were awarded a grant-in-aid by the American Association for the Advancement of Science to assist in our work for 1939.

Pollen of the chestnut was received from the following institutions or persons, whose cooperation we take pleasure in acknowledging:

June 22. From Division of Forest Pathology, U. S. D. A., Washington, D. C., through Mr. R. B. Clapper. Pollen of *Castanea ozarkensis, Ashei, alabamensis, margaretta,* and *dentata* (F.P. 555).

June 23. From T. V. A., Norris, Tenn., through Mr. J. C. McDaniel. Pollen of *C. dentata* "Seymour" (S.P. 550), *C. dentata* "Tait," La Sueur hybrid (*C. pumila* x *C. dentata*), and *C. crenata* (S.P. 541).

June 24. From Division of Forest Pathology, U. S. D. A., Washington, D. C., through Mr. R. B. Clapper, pollen of *C. dentata* (F.P. 555), Boone (*C. crenata* x *C. dentata*) and Marron (*C. sativa*)—the last two from Arlington, Va.

July 8. From Dr. W. C. Deming, Litchfield, Conn. Pollen of a valuable individual of *Castanea mollissima.*

July 11. From Mr. Alfred J. Frueh, West Cornwall, Conn. Pollen of *C. dentata.*

July 18. From T. V. A., Norris, Tenn., through Mr. J. C. McDaniel. Pollen of *C. mollissima* (S.P. 686).

Besides the above sources of *C. dentata* pollen, I bagged some roadside shoots in the town of North Haven, Conn. (as I had done for the past two years) and also, on July 10, secured a good quantity from roadside shoots on the property of Mrs. J. A. Burden, Jr., Syosset, Long Island. Some of our trees raised from nuts from Portland, Maine, and planted in the spring of 1926, were yielding pollen, and this also was used.

Summary of New Hybrids.—During 1938, 11 new hybrid types resulted from our pollination work. Since many of our earlier hybrids were new, any crosses made with them are necessarily themselves new. We have now made, in all, 43 new combinations of *Castanea.* We are not, however, striving to make as many new combinations as possible; we are only trying to reach our goal through several different routes. During 1938 we secured 930 nuts (that is, 930 potential hybrid trees) from the different crosses made at Hamden in 1938.

Following is a table (p. 58) showing the growth, in recent years, of a few of our best hybrids.

Cooperative Plantings.—The number of hybrids is growing at such a rapid rate (704 hybrid nuts last year and 930 this year) that there is no longer room to set out all of the young trees on our own plantations at Hamden. Therefore, in 1938, we entered on a system of cooperative plantings, and in accordance with this plan sent 276 of our 1938 hybrid nuts to Dr. W. W. Herrick, who has a large farm at Sharon, Conn. The trees on Dr. Herrick's land will be in charge of his gardener, Mr. Adolph Anderson, and will be inspected by us occasionally and used for further breeding or for propagation whenever we think it is advisable.

A similar arrangement was made with the New Haven Water Company, through Prof. Ralph C. Hawley of the Yale School of Forestry. 323 of our 1938 hybrid nuts were given to Mr. Frank Stowe, foreman in charge of the grounds at the Maltby Lakes region. The remainder of the hybrids were planted in our cold frames at the Brooklyn Botanic Garden.

TABLE SHOWING GROWTH OF A FEW BEST HYBRIDS

Name	Number, and year when nut was produced	Height					
		1936		1937		1938	
		ft.	in.	ft.	in.	ft.	in.
Hammond—*crenata* × *dentata*	H86–31	14	10½	19		24*	
" —*crenata* × *dentata*	H94–31	9	6	11	4	14	
Winthrop—*crenata* × *dentata*	W40–31	9		13		15	
Smith—*crenata* × *dentata*	S170C–31	10	6	13	6	18*	
" —*crenata* × *dentata*	S200B′–31	10		11	6	14	6
" —*crenata* × *dentata*	110–32	9	10	13		17*	6
Minturn—*crenata* × *dentata*	M19′–33	6	8	11		15*	
Hammond—*crenata* × *dentata*	H118A′–33	6	1	10		13	
[1] S8 × *crenata*	9B–34	3	5	5	10	9	
mollissima × *Seguinii*	20–34	3	4	4	8	6	
dentata × "S8"	LI60B–35	2	4	5		7	
"S8" × *dentata*	40–35	1	9	4	2	5	6
"S8" × *dentata*	3B–36			1	5	2	8
[2] S191B 31 × S233B 31	70B–36			1		3	
[3] *mollissima* × Hammond 86	328B–37					2	1
[2] 200B′ 31 × 171A 31	17B–37					2	1

* Year's growth in 1938, four feet or more.

[1] "S8" is a hybrid made by Dr. Walter Van Fleet of the U. S. D. A. It is believed to be a cross of the Japanese chestnut, *C. crenata*, with the American chinquapin, *Castanea pumila*.

[2] These are second generation crosses, i.e. F2's, of (Smith) Japanese-American hybrids.

[3] This is a cross of one of our most blight-resistant Chinese (*C. mollissima*) with our best Japanese-American hybrid (the first in the above list) and represents the most promising stock we now have. We have also other seedlings of the same pedigree now growing.

A list of nuts, with their senders, which were received in 1938, follows:

Nuts Received from Outside Sources and Planted in Cold Frames, Fall of 1938

Mar. 1. *Castanea dentata* from Mrs. C. D. Anglemeyer, Cranford, N. J.

Oct. 1. *C. mollissima* from Mr. J. B. Gable, Stewartstown, Pa.
C. mollissima × *C. crenata* from Mr. H. F. Stoke, Roanoke, Va.

Oct. 4. *C. dentata* from Mr. H. E. Willmott, Huntington, L. I.

Oct. 6. *C. dentata* from Miss N. P. Hewins, of Brooklyn, collected at West Redding, Conn.

Oct. 14. *C. dentata* from Mr. J. J. McKenna, of Reading, Pa., collected at Ruscomb Manor, Berks Co., Pa.

C. dentata, through Mr. J. H. Schmidt, from Mr. John Colin, Millhurst, N. J.

Oct. 18. *C. crenata* from Mrs. Malcolm J. Edgerton, Stamford, Conn.

Oct. 25. *C. crenata* from Mrs. Malcolm J. Edgerton, Stamford, Conn.

Inventory.—Following is a list of the numbers of individuals of all the species, varieties, and hybrids now growing on our Hamden plantations, making a total of 1850 trees. Starred species were received in April from the Division of Forest Pathology, U. S. D. A.

Chestnut Species, Varieties, and Hybrids
Growing at Hamden, Connecticut
October, 1938

Name	Number of Trees
**Castanea alnifolia*—Alder-leaved Chinquapin	5
C. Ashei—Ashe Chinquapin	11
C. crenata—Japanese Chestnut	42
C. crenata (Forest Type)—Japanese Chestnut var.	42
C. dentata—American Chestnut	126
C. Henryi—Chinese Timber Chinquapin	17
**C. margaretta*—	2
C. mollissima—Hairy Chinese Chestnut	70
C. mollissima var. Mammoth—Chinese Chestnut var.	2
C. ozarkensis—Ozark Chinquapin	11
C. pumila—Chinquapin	40
C. sativa—Spanish Chestnut	69
C. Seguinii—Chinese Dwarf Chinquapin	15
"S8" (*C. crenata* × *C. pumila*) (U. S. D. A.)	4
C. crenata × *C. dentata*	83
C. crenata (forest type) × *C. dentata*	12
C. crenata × "S8"	5
C. crenata × (*C. crenata* × *C. dentata*)	26
(*C. crenata* × *C. dentata*) × *C. crenata*	77
(*C. crenata* × *C. dentata*) × *C. dentata*	4
(*C. crenata* × *C. dentata*) × *C. mollissima*	5
(*C. crenata* × *C. dentata*) × *C. sativa*	1

(*C. crenata* × *C. dentata*) × *C. Seguinii*	1
(*C. crenata* × *C. dentata*) × (*C. crenata* × *C. dentata*)	100
(*C. crenata* × *C. dentata*) × (*C. mollissima* × *C. Seguinii*)	1
C. dentata × *C. crenata*	1
C. dentata × *C. mollissima*	14
C. dentata × "S8"	13
C. mollissima × *C. crenata*	4
C. mollissima × *C. dentata*	41
C. mollissima var. Mammoth × *C. dentata*	11
C. mollissima × *C. Seguinii*	4
C. mollissima × "S8"	3
C. mollissima × (*C. crenata* × *C. dentata*)	87
(*C. mollissima* × *C. pumila*) × *C. dentata*	9
(*C. mollissima* × *C. crenata*) × *C. sativa*	3
(*C. mollissima* × *C. Seguinii*) × *C. crenata*	8
(*C. mollissima* × *C. Seguinii*) × *C. sativa*	1
(*C. mollissima* × *C. Seguinii*) × (*C. mollissima* × *C. Seguinii*)	2
"S8" × *C. crenata*	13
"S8" × *C. dentata*	17
"S8" × *C. sativa*	16
"S8" × *C. Seguinii*	9
"S8" × *C. mollissima*	4
"S8" × (*C. crenata* × *C. dentata*)	6
Seedlings from "open pollinations"	213
Chinese and Japanese seedlings (approximately)	500
Total	1850

Respectfully submitted,

ARTHUR H. GRAVES,
Curator of Public Instruction.

SYSTEMATIC BOTANY

The Classification of Dicotyledons

BY ALFRED GUNDERSEN

Additional color studies of floral development 11 x 16 inches were completed by Miss Maud H. Purdy, so that we now have ten, representing the genera *Magnolia, Nymphaea, Helianthemum, Gordonia, Lagerstroemia, Portulaca, Primula, Campsis, Campanula* and *Iris*. Studies of flower structures and placentation have been continued. In large part these have been made with a fourteen power lens in the Garden during the spring months; in special cases higher powers have been used.

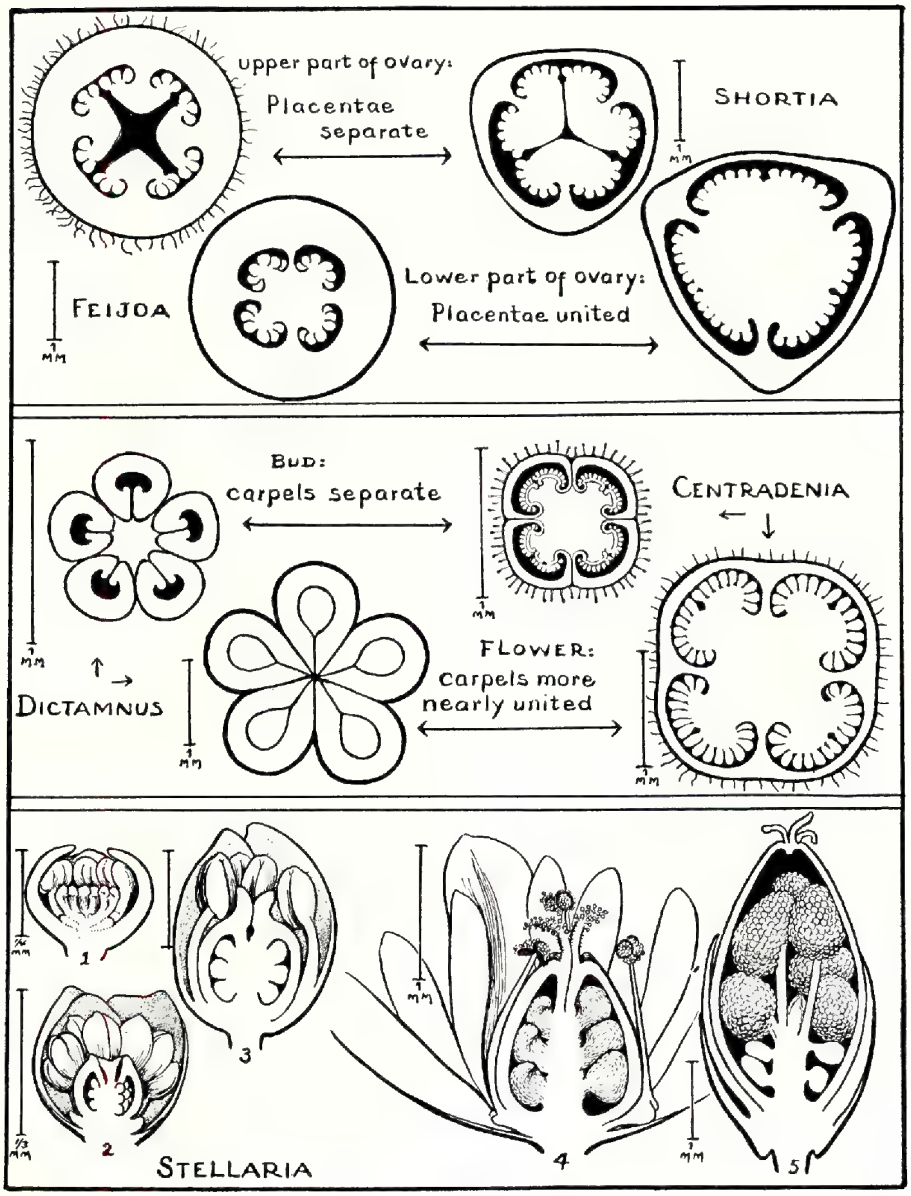

FIG. 5. Structure of ovaries in flower-buds and flowers, with special reference to the attachment of the ovules (placentation). For explanation see page 62.

The general subject is illustrated on the preceding page. In the upper figure we see the upper and lower parts of the ovary of *Shortia galacifolia* (*Diapensiaceae*) and *Feijoa Sellowiana* (*Myrtaceae*). In each case the upper part shows parietal, the lower part axile placentation. This is analogous to the situation in sympetaly, where the separate tips of the corolla represent the primitive condition. The middle figure illustrates *Dictamnus albus* and *Centradenia floribunda*. We see the carpels are more nearly separate in the bud, more or less fused in the adult. In the lower figure the development of placentation in *Stellaria media* is shown, essentially parietal at first, gradually fusing to central placentation. Finally, after fertilization, the upper part of the axis disappears.

In October, 1923, in a Brooklyn Botanic Garden *Leaflet*, I stated, " With the carpels closed to form a compound pistil, the ordinary axile placentation results. Parietal placentation as in rockrose, violet and poppy, and central placentation as in pink and primrose, are probably derived forms," again in October, 1925, " The probable direction of evolution in flowering plants may be briefly summarized: axile placentation to parietal or central." Some time later a discussion with Dr. P. A. Rydberg caused me to doubt the above conclusions and to begin a study of the subject of placentation. Gradually it became clear that prevailing views had been mistaken, and also that application of placentation to the classification of dicotyledons in various respects simplifies the system. Hutchinson stated in 1926, " The parietal type of placentation generally preceded the axile, basal or apical types, the axile being the final and most efficient condition." But little application of this principle appears to have been made in Hutchinson's book on Dicotyledons, as when he derives *Lythrales, Geraniales,* and *Gentianales* from *Caryophyllales*. The *Caryophyllaceae* appear to have had a better position in the old systems, namely near *Frankeniaceae*. In the Hutchinson system, however, numerous groups with parietal placentation just follow *Magnoliales*. With these groups might well be joined *Rhoeadales, Violales,* and other orders from the herbaceous side of his system of classification; and similarly in other cases, by uniting along various lines Hutchinson's groups " arborescent " and " herbaceous," we believe a more

natural classification results, and one much less different from other systems.

The following summary is from an article soon to appear: 1—In many characters, such as sympetaly, zygomorphy, and epigyny, the study of floral development confirms accepted views of phylogeny. 2—Flowers with parietal placentation are similar in the bud and in the adult form, but those with axile placentation usually have a beginning of parietal placentation in the bud. 3—In the classification of dicotyledons, groups with parietal placentation, such as Cacti (*Opuntiales*), Violets and their relatives (*Parietales*), Poppies and their relatives (*Papaverales*), should be placed together early in the system as relatively primitives groups.

Eleocharis and Field Work

By Henry K. Svenson

The extensive work on *Eleocharis,* which I began about ten years ago, has now been completed. This group of sedges comprises about 150 species. These are of world-wide occurrence (chiefly in the tropics, but about 80 species are known in the United States and Mexico), among them being such important economic species as the Chinese water-chestnut (*Eleocharis dulcis*). A number of tropical species are useful to primitive people in making mats, raincoats, and other clothing. In the course of this work I have consulted (often at great length) the important botanical publications of practically every country in the world, have borrowed or seen material from virtually every large herbarium collection in this country, and have personally seen many of the prominent collections in Europe. This problem has brought the Brooklyn Botanic Garden into direct mutual relationship with botanists and museum directors in Australia, Japan, India, Czechoslovakia, Denmark, Greenland, Uruguay, and the larger countries of Europe and South America; I doubt if contacts of a permanent nature could be established more readily than through the study of a single group of plants of world-wide distribution. A general biological paper on geographic distribution and the problem of species (as shown by *Eleocharis*) I expect to complete during 1939.

The summer of 1938 was spent in field-work in Tennessee and adjoining states, large collections being made on the Cumberland Plateau and in the oak barrens of Middle Tennessee, chiefly in Coffee and Franklin Counties. The collection of material for our herbarium (about 8000 specimens) will serve as the basis (in addition to previous work) for an annotated discussion of the plants of Tennessee, an area now undergoing extensive changes owing to the building of great dams in the valley of the Tennessee River by the Tennessee Valley Authority (the so-called T. V. A.) of the Federal Government. In addition to herbarium material assembled for permanent records a large number of photographs were taken in natural color. For help during this field work I have been especially indebted to Dr. H. M. Jennison, of the University of Tennessee and Botanist for the Great Smoky Mountains National Park; to Dr. J. M. Shaver, of Peabody College, an authority on the vegetation of the Nashville area; and to Dr. Roland M. Harper, of the State Geological Survey of Alabama.

In addition to routine work, I am engaged in a survey of the vegetation of the valley of the Batavia Kill in the northern Catskill Mountains; in identification of sedges from temperate and tropical America; and in the preparation of a flora of Cocos Island.

Genetics

Experimental Variation in Nephrolepis

By Ralph C. Benedict

The *Nephrolepis* collections have been maintained, both as a record of research carried on and published here at the Garden, and as a basis for further research. Early in 1938, Dr. A. F. Blakeslee suggested the institution of experimental work on ferns with colchicine. Dr. Blakeslee and associates at Cold Spring Harbor have been obtaining some significant results with this chemical on flowering plants, liverworts, and other groups of plants.

The use of colchicine as a means of artificially inducing variation in plants has opened up a very promising line of investigation which holds considerable possibilities of practical value as well as scientific interest. This chemical has been shown to have the

effect of causing doubling of the number of chromosomes, thus resulting in what are called tetraploid varieties. The Boston Fern group of variant forms or " sports " holds unusual possibilities for this line of experimentation, both because of their known extraordinary capacity for vegetative variation, and because positive results with colchicine may be expected to lead to the formation of spore-fertile types from varieties which now can be reproduced only from runners.

The preliminary experiments carried on during 1938, both at the Botanic Garden, and at Brooklyn College, seem already to have shown positive results. During 1939, the writer hopes to be able to complete one or two extensive series of colchicine tests as a basis for publication. If possible, arrangements will be made for a leave of absence from college teaching during the latter half of the year, for this purpose, both in the investigation of the effect of colchicine on ferns in general, and in the further study of the behavior of any new varieties which may result. A program of research in the fundamentals of variation and heredity lasting years is here indicated.

Economic Plants

By Ralph H. Cheney

1. As a part of the general investigation of the taxonomy and flavor qualities of beverage plants, a collection of herbarium specimens was made of the species and varieties of the Mints which are grown and used in eastern Massachusetts. Photographs were made of the living plants.

2. A study of the microstructural changes caused by the plant purine, caffeine, was made during the summer at the Marine Biological Laboratory, Woods Hole, Massachusetts.

3. The variation in the blood sugar in man was determined after the consumption of caffeine per se and of the coffee beverage.

REPORT OF THE CURATOR OF PUBLIC INSTRUCTION FOR 1938

To the Director:

I submit herewith my report of the work of this department for the year 1938.

Garden Attendance

A slight increase in general attendance at the Garden during the year 1938 is shown in the subjoined table. During the week-end April 30–May 1, more than 56,000 people (56,145) visited the Garden. The attendance at the week-end just previous, April 23–24, was more than 51,000 (51,641). Even this latter figure was considerably in excess of the largest week-end attendance in 1937, which was approximately 48,000. The total attendance for these two week-ends (April 23–24 and April 30–May 1) was therefore more than 107,000 people. The marvelously beautiful display of Japanese cherry blossoms along "Cherry Walk" was doubtless the chief occasion of these record attendances. These flowers, by-the-way, arrived this year at least a week earlier than their usual time.

Conservatories.—The attendance at the conservatories, 145,015, showed a slight increase over that of 1936 (140,011), but was not as large as that of 1935 (154,659). (In 1937, attendance records at the conservatories were deficient because extensive repairs necessitated closing them to the public much of the time.) However, for the month of April the total conservatory attendance was 30,572, which is, I believe, the highest monthly figure ever recorded. The previous high record of 30,262, for April, 1934, was thus bettered.

Attendance at Classes and Lectures.—The combined attendance at classes and lectures held at the Garden was 72,294. This total is smaller than last year for several reasons. The attendance at classes for adults has hitherto been notably increased by teachers taking work for professional advancement to meet the requirements of the Board of Education. At present fewer new teachers are being taken into the school system, and, therefore, there are fewer enrollments in professional advancement courses. Also, more professional advancement courses are being given by the regular personnel of the schools.

There is every evidence that more school classes visited the Garden in 1938 than in previous years, but the *registered* attendance has been less because many of these classes have been brought by WPA guides, and no plan had been worked out in advance, nor during the year, for securing the attendance figures of these classes.

ATTENDANCE AT THE GARDEN DURING 1938

	Jan.	Feb.	Mar.	Apr.	May	June	July
At regular classes	634	1,179	3,710	3,311	2,419	2,923	4,180
At visiting classes	450	430	2,171	5,760	14,882	3,740	46
At lectures to children	180	180	1,295	3,069	5,612	1,366	23
At lectures to adults	412	25	120	166	576	0	55
At conservatories	10,150	5,929	12,502	30,572	23,384	10,324	9,931
At grounds	65,659	64,831	135,088	331,095	240,781	184,869	162,589

	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Totals
At regular classes	4,200	2,669	1,875	3,011	2,551	32,662
At visiting classes	102	239	5,759	4,016	2,037	39,632
At lectures to children	16	66	2,854	2,137	1,037	17,835
At lectures to adults	86	450	15	6,000	0	7,905
At conservatories	8,802	9,169	10,176	6,566	7,510	145,015
At grounds	159,043	138,651	64,016	112,589	66,908	1,726,119

ADULT COURSES

New Courses Offered in 1938.—"Planning and Planting the Small Place" was the title of a course of five lectures on Wednesdays at 11, Jan. 12 to Feb. 9, conducted by Mr. Montague Free. Miss Helen Swift Jones, member of the American Society of Landscape Architects, was the guest speaker. Dr. Gundersen gave a course of 3 lectures in March on the general subject of the interdependence of plants and animals in evolution. About 70 people elected the course. I conducted a new course entitled "Walks and Talks in the Botanic Garden," consisting of trips about the Garden to see its plan and the various special gardens when the latter were at their most attractive phase. An advanced course in "Spring Garden Work," consisting of six demonstration-

lectures, accompanied by practical work in the greenhouses, was offered on Fridays, Feb. 18 to March 25, with Miss Margaret M. Dorward the instructor. At the request of several teachers and others interested in the taxonomy of seed plants, Miss Rusk organized a course of 15 weeks duration, meeting at the Garden Saturday mornings, commencing November 5.

Other Courses Conducted by Members of this Department.—In addition to those already noted under " new courses " the following courses, announced in the Prospectus, were conducted by members of this department:

1. *Trees and Shrubs of Greater New York.*—Given, as usual, on Saturday afternoons in the spring and fall by Miss Vilkomerson and myself.

2. *Medicinal Plants and General Botany in Relation to Medicine.*—This course, for student nurses, was conducted for the 12th consecutive year, the enrollment being, Kings County Hospital (spring) 56, (fall) 103; Prospect Heights Hospital (fall) 11; and St. Johns Hospital (fall) 32, making a total for the year of 202. Kings County is the only one of these three hospitals which admits students in the spring as well as in the fall, so that the spring class consists of Kings County Hospital students only. The fall students, 146 in all, were divided into 3 groups of about 50 each, which met at the Garden on Wednesday, Thursday, and Friday mornings through October, November, and part of December.

3. Beginning with the new school year in the fall, Miss Rusk conducted her course in General Botany from the standpoint of " adult education," rather than that of a college course, and from a cultural rather than technical point of view.

4. *Flowering Plants: Field and Laboratory Study.*—During the first half of the year, Miss Rusk continued with this course which had commenced the previous fall.

5 & 6. During the spring Miss Rusk conducted a *Field Class in Native Wild Flowers* for seven weeks, and in the fall, a similar class for six weeks.

Total Adult Registration.—The total number of adults registered in our courses in 1938 was 761, a five per cent. decrease from the registration in 1937, which was 802. A possible explanation

of this decrease may be found in the increasing variety of subjects now being offered throughout the city, for adult education. This rapidly expanding field results, naturally, in greater competition with our own activities.

Lectures and Trips for High School Science Clubs or Classes

On January 17 we mailed out to the high schools of Greater New York the following announcement:

Brooklyn Botanic Garden

Offers to High School Science Clubs or Classes

1. Lectures illustrated with Lantern Slides
2. Conservatory Trips with Explanatory Talks
3. Outdoor Trips in the Garden, with Explanatory Talks

1. Lectures (to be given either at the Garden or at the School)

Wild flowers (spring, early summer, fall)
Wild berries and other fruits
Familiar ferns
Our common broad-leaved trees
Our common evergreen trees
Garden flowers
Showy fruits of garden plants
Seaweeds (for small classes: illustrated by specimens only; no slides)
Common food plants
Useful plants other than food plants
Mushrooms and toadstools
Control of plant diseases
Plant propagation
Reproduction in plants
Variation and evolution in plants
Plant breeding
Breeding disease-resistant chestnut trees
Conservation of plants—including forestry
Plant specialization in relation to habitat (ecology)

It is suggested that, when lectures are given at the Botanic Garden, they be combined with trips that cover a related field.

2. Conservatory Trips

   Economic plants
   Plant propagation
   Variation and evolution
   Plant specialization in relation to habitat

3. Outdoor Trips in the Botanic Garden (May through November only)

   Spring wild flowers
   Fall wild flowers and fruits
   Common broad-leaved trees
   Common evergreen trees
   Garden flowers or fruits
   Gardens within a garden: the plan of the Brooklyn Botanic Garden
   Story of flowering plant development (trip through the Systematic Section)
   Plant societies (trip through Local Flora Area)
   Boulders in the Brooklyn Botanic Garden (Glacial history of the Long Island region). This trip is offered for any month of the year.
   All classes must be accompanied by their own teachers.

As a result of this circular, classes from eleven different high schools, totalling nearly 1000 pupils (956), visited the Garden for lectures and trips—this in spite of the facts that the time schedules for high school work and the distance of many of the schools from the Garden make planned group visits a very difficult problem. The following High Schools sent groups to the Garden for instruction:

Abraham Lincoln
Alexander Hamilton
Bayside
Bishop Loughlin Memorial
Brooklyn High School for Homemaking
Curtis (Staten Island)
Erasmus Hall
Franklin K. Lane
Girls Commercial
Haaren
High School of Music and Art

The trip of the Abraham Lincoln High School pupils (Dr. Lloyd A. Rider, Chairman, Biology Department) might serve as a model for that kind of work. The staff of the biology department visited the Garden about two weeks before the trip was to be held, and after a conference with me, made a tour of the

Garden, going over every detail of the proposed trip. This included the Japanese Garden, Rose Garden, Wild Flower Garden, Systematic Section, Rock Garden and Boulders, Children's Garden, Experimental Garden, Water Gardens and Laboratory Plaza. As a result of this preliminary visit, a mimeographed questionnaire was prepared by the school. Each pupil, on entering the Garden, was handed this sheet and was required to answer the questions.

On arrival at the Garden, on Saturday morning, May 7, the pupils, 300 in all, were divided into 10 groups, each in charge of one of their own instructors. Members of our department were stationed at important points to explain special features. At the close of their trip through the Garden they assembled in our auditorium, where I gave an illustrated lecture on the topics, "Conservation of Plants," and "Forestry."

As an illustration of the popularity of the Garden at this period of the year (May), I enumerate here the different groups that were being conducted on this particular morning: Class from Brooklyn College, Class from the City College, Girl Scouts, Class of Biology Teachers, Abraham Lincoln High School (Biology Department), 300 pupils.

Statistics of School Service

	1938
Loan Lectures (Lantern Slides, etc.)	
No. of sets lent	24
No. of teachers involved	66
No. of pupils attending	5,249
Material Supplied	
Total number of requests from schools	540
Number of different institutions	168
High Schools and High School Annexes	
Brooklyn (Total No. 39)	23
Queens (Total No. 23)	9
Manhattan (Total No. 33)	13
Other Boroughs (Total No. 24)	8
Junior High Schools (Total in Brooklyn 25)	8
Colleges and Universities (Total in Brooklyn 7)	8
Elementary Schools	
Brooklyn (Total No. 240)	61
Queens (Total No. 145)	1
Manhattan (Total No. 127)	1
Other Boroughs (Total No. 149)	5

Private and Parochial Schools	16
Other Institutions	15
Number of potted plants for nature study	2,259
Number of Petri dishes filled with sterilized agar	1,599
Total number of teachers supplied with material	2,888
Total number of pupils reached	159,441
Living Plants Placed in School Rooms	
No. of schools	28
No. of plants	334
No. of teachers involved	567
No. of pupils reached	24,171
Plants Distributed (Raised in Classes)	41,846
No. of persons taking plants	1,643
Total number of schools represented	142
Seed Packets for Children	
No. of schools	513
No. of teachers	7,765
No. of pupils	310,662
No. of packets	931,724
Exhibits Provided	
No. of exhibits	4
Viewed by	130,400

Flower Days

The following Flower Days were held in 1938:

Tuesday, June 7. *Eleventh Annual Rose Garden Day.* Speaker: Mrs. Frederick Love Keays, author of "Old Roses." Topic: Old Fashioned Garden Roses.

Tuesday, September 27. *Herb Garden Day.* Formal exercises to celebrate the opening of the new Herb Garden. Speakers and topics: Mrs. Hollis Webster, Lexington, Mass. Director, Herb Society of America. "Culinary Herbs." Frederick Schroeder, Ph.G., M.D., F.A.C.P., Brooklyn. Long Island College of Medicine. "The Importance of Medicinal Herbs in Modern Medicine."

Because of the rather disastrous effects of the heavy rains in late September, it was decided to omit the usual Fall Rose Garden Day.

Wild Flower Trip for Nature Lovers

On Friday, May 20, a delightful sail up the Hudson River to Indian Point, near Peekskill, on the steamer "Peter Stuyvesant" was taken by members of garden clubs and their friends, and by nature lovers in general. The trip was organized by the Hudson River Day Line. During the sail up the river, Dr. R. C. Benedict, Resident Investigator at the Garden, gave a talk on native wild flowers and ferns, and exhibits of living and dried plant specimens were available for inspection. On arrival at Indian Point, after an interval allowed for luncheon, various groups were organized for the study of wild flowers, ferns, trees and shrubs, and birds. About 150 persons took the trip. The following guides were present from the Garden: Dr. Ralph C. Benedict, Dr. Arthur H. Graves, Dr. Alfred Gundersen, Miss Hester M. Rusk, Miss Hilda Vilkomerson.

Publicity and Editorial Work

As usual, we have continued to send, at intervals of one or two weeks, items for release to the Associated Press, metropolitan newspapers, and horticultural journals. Such items are for the purpose of keeping the public informed about flower displays, rare plants in bloom, forthcoming lectures, classes, exhibits, field trips, activities of staff members, etc. As evidence of the publicity thus obtained, we received 1079 clippings from various sources, as against 1082 in 1937.

Schedules of broadcasts over various stations by our personnel, from January to June inclusive and from July to December, were prepared, printed, and issued to members of the Garden and others. Programs of our adult classes offered to the public and to Garden members were prepared, printed, and issued in April and September. Schedules of regular and visiting classes, and other appointments, were mimeographed each week throughout the school year, and distributed to members of the staff. The annual *Prospectus* of classes, lectures, and other educational advantages offered to members and to the general public, was prepared and issued as the October number of the Brooklyn Botanic Garden Record. I continued to serve as Editor of the Plant Section of

FIG. 6. Classes from Public School 44, Richmond (Staten Island), visiting the Botanic Garden for outdoor study of plants.
(9607)

General Biology for *Biological Abstracts* and, as usual, have had general editorial supervision of the *Contributions* of the Garden. I have also continued to serve (since 1933) as a member of the Council of the Torrey Botanical Club.

Other Activities of Department Members

In May Miss Rusk spent four days at the "wild garden" of the Litchfield Garden Club, making a partial list of the plants there. In June she attended the summer meeting of the Botanical Society of America at Ottawa, Ontario, and collected plants there for the Garden herbarium. Throughout the year she served on the Local Flora Committee of the Torrey Botanical Club, attending monthly meetings for the study and mapping of certain groups of plants. She also served as librarian of the American Fern Society, whose library is deposited here at the Botanic Garden.

Throughout the year much of my spare time has been spent in furthering the work on our chestnut project, namely the development of a disease-resistant chestnut of a type suitable for timber. In this work I have had the able assistance of Miss Rusk and Miss Vilkomerson.

Miscellaneous Items

The "Exhibit of the Week" feature was continued through the year, and was in charge of Miss Vilkomerson. A full account of this will be found in my last Annual Report.

Hay Fever Studies.—For two months in the fall, Miss Rusk cooperated with Dr. Max Harten, of the Jewish Hospital, in his hay fever studies, by exposing a fresh microscope slide every day out of doors to catch pollen from the air.

Rare Woods Sent to Yale.—Specimens of *Styrax japonica* and *Syringa pekinensis* were sent to the Yale School of Forestry for the collection of woods there.

Flora of Long Island.—Throughout the year Miss Rusk has spent a considerable part of her time collecting data on the flora of Long Island, with a view to publishing a reference book on the subject.

Bird Lists.—Through Mr. Bernard P. Brennan, of the Brooklyn Bird Club, we have continued to receive lists of birds seen in the

Brooklyn Botanic Garden. These lists have been posted on the bulletin boards on the Grounds, each week through the spring and summer, and at longer intervals through the autumn and winter.

Postcards were mailed to members on April 4, advising them that the correct methods of rose pruning might be seen between April 8 and 23 in the Rose Garden; and on April 22, advising them that a quantity of propagative material—dwarf hardy asters and miscellaneous herbs—was available for distribution.

School Art League, of New York, through its director, Miss Margaret L. Murphy, arranged for four art lectures (given by outside speakers) at the Garden. At one of these, on Japanese gardens, the students were conducted through the Japanese Garden, and its symbolism was explained, by members of this department.

Bureau of Information.—Throughout the year we have had many letters and requests by telephone and in person for information about plants. Although many of these are interesting, particularly since they show the variety of ways in which a botanic garden can be of service to the public, even a bare enumeration of them would require several pages. This part of our work requires a considerable portion of our time.

Respectfuly submitted,

ARTHUR HARMOUNT GRAVES,
Curator of Public Instruction.

REPORT OF THE CURATOR OF ELEMENTARY INSTRUCTION FOR 1938

TO THE DIRECTOR:

I hereby present my annual report for the Department of Elementary Instruction for the year 1938.

ROUTINE WORK

During the year the regular lines of work were carried on as usual. One hundred ten different schools took advantage of our visiting class work. This figure does not represent by any means the number of classes which came, but simply the different institutions. Over 80,000 children were contacted through our study

material and about 25,000 through the distribution of plants which are sent to schoolrooms for decoration. Over 40,000 plants were raised in our instruction greenhouses, and during one month alone, the month of March, over 1,100 people worked in the greenhouse, including both children and adults. Over 2,000 plants were supplied to the different school gardens.

Among the lectures given in 1938, the most outstanding were those given in June. On June 27, I presented "The Educational Work of the Brooklyn Botanic Garden" at the Department of Science Instruction meeting, at the National Education Association Convention in New York. On the next day I gave a second talk and demonstration with children from our Saturday morning classes. A number of talks were given over the radio, one in December, at Richmond, Virginia, over WMBG, on "Gardens for Children." At the same time an announcement was made of the Curator's appointment to the presidency of the American Nature Study Society, an organization affiliated with the American Association for the Advancement of Science, meeting in Richmond this year.

In early June the new Botanical Garden in Montreal sent Miss Marcelle Gauvreau to spend a week with us studying the methods we used in our Saturday morning classes and our visiting classes, and later, Mr. Marcel Racine, from the same institution, came for a day's survey to follow up some of the results of Miss Gauvreau's study.

Miss Miner was still on leave of absence to make a survey of children's garden work for the National Recreation Association until October 1, when she returned to the Garden. During her absence Miss Michalena L. Carroll substituted for her and was then asked to stay for the year 1939. Miss Carroll attended the Blue Ridge Fourth Annual Cooperative Art Conference, at Blue Ridge, N. C., where she was one of the art staff during their Conference.

Our outdoor garden carried on its usual activities with Miss Dorward taking charge in the absence of Miss Miner. One of the interesting features of the garden this year was the French class. Mr. Nicholas Fiorenza, a graduate of St. Francis College, gave a course in botanical French, in which the children learned the French names of the flowers and their parts.

Twenty-Fifth Anniversary

On May 14, the School Garden Association of New York gave a testimonial luncheon for the Curator in honor of twenty-five years of work with boys and girls at the Brooklyn Botanic Garden, and on that occasion a bronze medal was presented by the organization in recognition of her service to the schools of the City.

The work of elementary instruction was started October 1, 1913, thus making the year of 1938 its twenty-fifth year. The Woman's Auxiliary of the Garden proposed to celebrate this occasion and formed a committee for this purpose, with Mrs. Charles E. Perkins and Mrs. Irving L. Cabot as joint chairmen. Through their efforts a group of Brooklyn educators, teachers, assistant principals, principals, and assistant and associate superintendents formed committees to take part in the celebration. Committees of parents of children in our classes, and students in former boys' and girls' classes also made their plans for the fall.

In order that the work of the Department and its progress might be effectively shown, an exhibit was set up which was first shown at the Spring Inspection in May, and later as a part of the Anniversary in October. The placing of the exhibit was put in Miss Carroll's hands. She planned the pictorial part of the display so that the activities of the Department might appeal to the visual senses as well as show the scholastic part of the work.

The exhibit itself was a difficult and almost colossal task to assemble. To select from twenty-five years of work those elements that should be presented to the public was not easy. Care was taken so that the work would be in itself a unit and yet show clearly its various phases, such as Saturday Morning Classes for Boys and Girls, the Outdoor Garden, Greenhouse Classes for Children, Greenhouse Classes for Adults, and Visiting Classes and Their Work.

In our Exhibit Room, across the end of the room opposite the door, was the legend, "25th Anniversary of the Department of Elementary Instruction" done in classic letters by Miss Carroll. Below that was a map showing the Department's service to the United States and ten or more foreign countries.

The complete exhibit showed many things, from the model of the children's garden, the types of tools used, to seedlings raised

in the greenhouses by children from eight years up to adult age; models of flowers representing different flower families which were made by children in Saturday morning classes; garden plans made by little children and older ones; notebooks; and exhibits set up by young people working on juvenile "research," such as the importance of economic plants and their use in visiting classes. All the steps of garden work were demonstrated, from the germinating of seed, methods of propagation and control, and culture of plants, to our flower borders worked out in masses of harmonizing colors and drawn to proper scale. Many other features were used for making clear to children the beauty of the plant world —drawings, charts, water colors of plants, seeds, seedling habits of growth, and life cycles. These features are used not only for Saturday morning classes, but also with visiting classes and as lecture material on trips to garden clubs and schools.

In order to show the work done in connection with the private and public schools, certain schools were chosen to display their work. In the corridor outside the Exhibit Room the fifth grade of the Brooklyn Ethical Culture School placed on exhibit their regular classwork on "Cotton," which had been supplemented by work here at the Botanic Garden. On a table were shown experiments including tests of cotton and wool, the making of nitrocellulose and plastics from cotton. There were also drawings, a small cotton gin made by a student, and songs composed by the children and supposedly sung by cotton pickers in the field.

P. S. 241, a neighborhood school, presented their work on cotton by means of a series of pictures to relate the story of cotton from earliest times up to the present day.

P. S. 119 sent drawings and written English on the Brooklyn Botanic Garden month by month. This class, with its teacher, Miss Ethel Cameron, had visited the Garden each month during the major part of a year.

Work done by the Garden Club of P. S. 9 in our greenhouses on weekly visits through the school year was on display. The Kindergarten of P. S. 183 was also represented by charts showing how the kindergartners and first-graders of the school took charge of the ordering of penny packets of seed from the Garden,

distributing them, planting the seed, and carrying on their work in their own outdoor garden.

With the twenty-fifth Anniversary in mind, Kodacolor motion pictures had been taken not only during the summer of 1938, but during the summer of 1937 under the direction of Mr. Louis Buhle, and in part by Miss Dorward. The illustrated legends for the pictures were made by Miss Carroll. It was possible, through the kindness of Mrs. Charles E. Perkins, to meet the cost of these motion picture reels.

Through Mrs. Henry J. Davenport, President of the Woman's Auxiliary, arrangements were made with the Paramount News to take motion pictures of the children's outdoor garden work. These pictures, too, were taken during the summer of 1938, and have been shown in motion picture houses throughout the country.

Since this year was dedicated largely to the Anniversary celebration, it might be well to note some of the outstanding figures of progress in different phases of our work, which, while not entirely accurate, are approximately true.

In our seed distribution in 1914, 25,000 packets of seed were sold and by 1938, this had grown to over 930,000, showing the progress in that work. This was shown by five-year blocks on pictorial graphs.

Teachers classes started with an attendance for the first five years, from 1913–18, of about 5,000, which has increased in the last five-year period to 15,000.

Visiting class work had an attendance in the year of 1913 of 4000; at the end of its first five years, 5017, and during the last period, over 50,000.

Children's Saturday classes had an attendance of 100 in 1913; at the end of the first five years this had reached more than 12,000, and at the end of 1937, approximately 41,000.

The exhibit represented the educational part of the Anniversary; the social side was sponsored by the Woman's Auxiliary.

On Tuesday, November 15, an evening reception was given at the Laboratory Building, and the following program presented.

THE SILVER ANNIVERSARY OF THE CHILDREN'S WORK AT THE BROOKLYN BOTANIC GARDEN

Tuesday, November 15, 1938

At Eight-Thirty

Presiding, Mr. Edward C. Blum, Chairman, Board of Trustees of the Brooklyn Institute of Arts and Sciences.

Anniversary Notes. Miss Hilda Loines, Chairman, Botanic Garden Governing Committee.

Welcome. Dr. C. Stuart Gager, Director of the Garden.

Greetings from the Brooklyn Institute of Arts and Sciences. Mr. James G. McDonald, President.

The Botanic Garden's Service to the Borough of Brooklyn. Dr. Jacob Greenberg, Associate Superintendent, Board of Education.

The Botanic Garden: Its Value and Advantage to a City School System. Mr. Henry C. Turner, Member of the Board of Education, and former President of the Board.

The Children's Work. Miss Ellen Eddy Shaw, Curator of Elementary Instruction.

Motion Pictures of the Children's Work.

Before the motion pictures were shown, a group of children representing the classes at the Garden outlined their work, speaking for the Curator. They had previously prepared and published a booklet in which they had written up the various phases of the work in Saturday morning and outdoor garden classes. This booklet was distributed to friends of the work.

On Thursday afternoon, November 17, at 4:15, a tea was given to the educational friends of the Brooklyn Botanic Garden, with the following program.

THE SILVER ANNIVERSARY OF THE CHILDREN'S WORK AT THE BROOKLYN BOTANIC GARDEN

Thursday, November 17, 1938

At Four-fifteen

Presiding, Miss Hilda Loines, Chairman, Botanic Garden Governing Committee.

Welcome from the Brooklyn Botanic Garden. Dr. C. Stuart Gager, Director.

Firsthand Knowledge of the Educational Work of the Brooklyn Botanic Garden. Miss Mary A. Kennedy, Assistant Superintendent of Schools, New York City.

The Contribution of the Department of Elementary Instruction to the Elementary Schools of the City. Dr. Stephen F. Bayne, Associate Superintendent in Charge of Elementary Schools, New York City.

The Children's Work. Miss Ellen Eddy Shaw, Curator of Elementary Instruction.

Motion Pictures of the Children's Work.

The third reception was held on Saturday afternoon, November 19, when the boys and girls in current classes held their meeting. The Girl President of the Boys and Girls Club presided, the Director greeted the guests, and the Curator made a short speech of thanks to the parents and the boys and girls for their share in the Anniversary celebration. A reception was held in the rotunda. At that time the parents of the children in this group presented their contribution of over $100.00 toward the Fund. At Christmas in 1935, the Boys and Girls Club of the Saturday morning classes had presented the sum of $25.00 of their own money toward the foundation of an Endowment Fund for the Children's Work, and with this in mind, the twenty-fifth Anniversary was celebrated.

On the evening of November 19, boys and girls of former classes had their meeting and the informal program which follows. Their reception, too, was held in the rotunda. The auditorium program was a fac-simile of programs of early years.

SILVER ANNIVERSARY PROGRAM, BOYS AND GIRLS CLUB
BROOKLYN BOTANIC GARDEN

Saturday Evening, November 19, 1938

Welcome. Clyde Nellis, of the first children's classes at the Brooklyn Botanic Garden.
Secretary's Report. Thekla Jung.
Letters from Members. Joel Guthman.
Silver Pin Topics: "Rubber." John Spollen;
"Our Garden." Fred Corby.
Presentation of Silver Pins. Dr. C. Stuart Gager, Director.
Speech by a former "Alfred T. White Scholarship Boy." John Wille.
Address and showing of slides of former years. Miss Ellen Eddy Shaw.
Notices. Mildred Blood Clark (Mrs. James Clark), Vice President.
Dismissal. Norman Kass.

Refreshments for this occasion were donated by Miss Harriet H. White, whose brother, Mr. Alfred T. White, had been such a friend to the children's classes in the early years. Mrs. Charles E. Perkins supplied music for the occasion. The group that evening also raised over $100.00 for the Fund as their token of appreciation and thanks to the Garden.

During the Anniversary time the Federated Garden Clubs of New York State sent an announcement of a silver medal awarded to the Curator as "An appreciation of the Silver Anniversary of the Children's Work at the Brooklyn Botanic Garden," to be presented at a later time.

On November 29, in the evening, a committee of teachers and school friends gave a Bridge for the furtherance of the work and the benefit of the Fund. On this occasion some of our local hotels, churches, florists, and commercial firms did their share in donating prizes, and providing chairs, tables, and other necessary equipment so that the affair should be almost entirely free of expense. Twelve hundred people attended the Bridge, and as a result, $1,350.00 was turned over to the Endowment Fund for Children's Work by the committee.

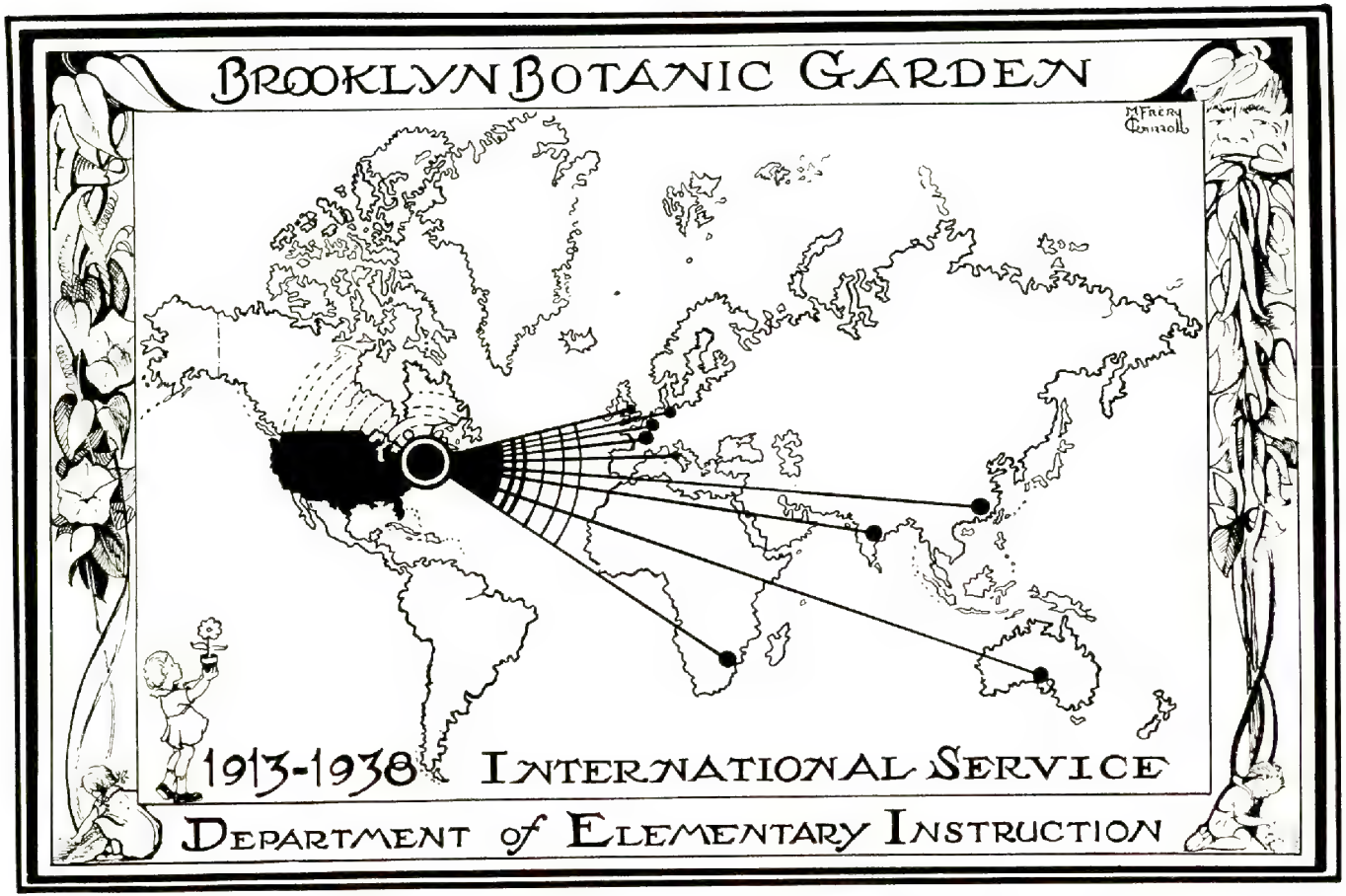

FIG. 7. The services of the Department of Elementary Instruction have extended to every state in the Union, several provinces of Canada, and eight other foreign countries. (9757)

A charming folder, designed by Miss Carroll, was sent out as a follow-up after the Anniversary, in which the children offered to our friends an opportunity to help make future work secure. At present (December 31, 1938) the Fund has reached more than $8,500.00, which we hope may be added to as the years pass by.

This might seem the proper occasion to thank all those helping to make our Anniversary a successful time. To the Woman's Auxiliary, the Board of Trustees, the educational friends of our Borough, to you, and my colleagues in this institution, my Department and I wish to extend our heartfelt thanks.

International Service of the Department

Like other departments of the Botanic Garden, the activities of the Department of Elementary Instruction have not been confined to Brooklyn. They have included all five boroughs of Greater New York, every state in the Union, several provinces of Canada, and eight other foreign countries, as shown in the accompanying map.

Miscellaneous

Four colored transparencies, of aspects of plant life, made by our photographer, Mr. Buhle, and colored by Miss Elizabeth Bonta, were placed early in May at the central panes of each of four windows in the Boys' and Girls' Club Room.

During the year 1938 I acted as Honorary Secretary of the National Plant, Flower and Fruit Guild, Director of the School Garden Association of New York, one of the Vice-Presidents of the School Garden Association of America, Consultant of the Federated Garden Clubs of New York State, Inc., and President of the New York Chapter of the American Nature Study Society. In December I was made national President of the American Nature Study Society.

Respectfully submitted,

Ellen Eddy Shaw,
Curator of Elementary Instruction.

REPORT OF THE CURATOR OF PLANTS FOR 1938

To the Director.

Herewith I respectfully submit report for the year 1938:

Woody Plants

Mr. Charles F. Doney, assistant in woody plants, reports that about fifty additional species were planted on the grounds, among them may be mentioned *Adina rubella, Vanieria tricuspidata, Benzoin umbellatum, Abeliophyllum distichum, Catalpa Duclouxii, Abelia chinensis, Viburnum dilatatum* var. *xanthocarpum,* and *Zanthoxylum planispinum.*

Plans are being made for rearrangement of the Pea Family. Numbers were placed on posts of the fence along Flatbush Avenue, as marks of reference, with a view to using the adjacent border mound for excess nursery material, gradually replacing common plants by more or less uncommon ones.

Maps and lists of shrubs in the systematic section have been remade and improved by Mr. Emil Barens, WPA assistant.

For some years we have used small wooden suspended labels, painted green, for labeling shrubs. Though often lost, these have proved very satisfactory because of the ease and cheapness with which they can be replaced.

Herbaceous Plants

In connection with the spring course on Herbaceous Plants, an inventory was made each week of plants in the beds and in the rock garden as they came into flower. From September Mrs. Margaret Putz has devoted her entire time to herbaceous plants. The collection of herbarium specimens of cultivated herbaceous plants has been improved. Determination of material must to a large extent be done during the winter. With few exceptions our outdoor woody plants are included in Rehder's Manual, but for our increasing and more changing collection of herbaceous plants we must turn in part to works from many countries and with different nomenclature and points of view. Attempting to unify these to some extent for our collections, we have begun to make

brief keys to include the species growing in our Garden at the present time, including also plants we think might make desirable additions. A number of species of *Dianthus* were placed in the nursery. It is desirable to expand the trial of special groups of herbaceous plants in the nursery to avoid so much changing in the beds.

Iris

Dr. George M. Reed reports that twenty-three varieties were received by exchange; of Japanese Iris, one from Cedar Hill Nursery, Brookville, New York and twenty from Flowerfield Bulb Farm, Flowerfield, New York; of southern species, two from Mr. Percy Viosca, Jr., New Orleans, La.

Labels

We continue to have trouble from removal of labels, especially in the rock garden. After more than twenty years' exposure various troubles are coming to our label holders in the beds. For some time I have been in correspondence with a western firm regarding label holders, and some experimental models have been made.

Conservatories

Four transparencies representing the tapping of rubber trees, a banyan tree with aerial roots, coconut rafts floating down a tropical river, and chocolate trees in fruit were completed by Mr. Louis Buhle and colored with mineral paints resistant to sunlight by Miss Elizabeth Bonta. These will be hung in the conservatories early next year.

During the winter I have had consultations with members of the staff regarding possible improvement of the conservatories. It is becoming yearly more difficult to find adequate greenhouse space for experimental work, study collections, propagating, potting, bringing exhibition material to perfection, and other needs besides that of maintaining exhibits open to the public.

Classes and Lectures

In March I gave three lectures at the Garden on "Plant-Animal Links in the Chain of Life." From April to June I conducted ten outdoor lessons on Herbaceous Plants; in the fall, ten lessons on Evergreens. In the spring, and again in the fall, Mr. Doney gave courses of ten lessons on Ornamental Shrubs.

Seed Exchange

Seeds for exchange purposes, chiefly of herbaceous plants, were collected during 1937, as published in the Seed List number of the Record for January, 1938. A total of 2,198 packets were distributed, 1,554 to exchanges and 644 to members of the Garden. A total of 1,010 packets were received, of which 103 were gifts and 846 received through exchange.

Other Activities

During the summer I attended the Torrey Club outing with Dr. House, state botanist, to the Taconic Mountains. Of special interest to me was the abundant occurrence of *Potentilla tridentata*, above Petersburg Pass, in the Catskills only found occasionally.

In the fall I visited Cornell University, for professional consultation with members of the department of botany.

Due to the unfortunate illness of Mr. Raymond Torrey, well-known writer, student of the local flora, and president of the Torrey Botanical Club, I acted as president of the Club during the fore part of the year, in my capacity as first vice-president. After Mr. Torrey's death, July 15, I was made president, and served until the end of the year.

Radio Talks

Ten radio talks were given by Mr. Doney over stations WNYC and WOR on plant exploration, garden landscaping, evergreens, and shrubs.

Statistics Relating to Living Plants

	Species or Varieties	Plants
Living Plants Received:		
By collection	10	30
By exchange	148	245
By gift	183	547
By purchase	77	379
Plants grown from seed	291	2,631
Total	709	3,832

Seed Exchange

Seed Packets Received:		
By collection	46	
By exchange	846	
By gift	103	
By purchase	15	1,010
Total		1,010
Seed Packets Distributed:		
To members	644	
By exchange	1,554	2,198
Total		2,198

Labels and Signs

Labels and signs were made by Mr. John McCallum as follows:

Small galvanized labels for herbaceous beds and for rose garden fence	263
Large galvanized labels for the herbaceous beds	88
Lead labels for woody plants	96
Lead labels for rock garden	124
Wood labels for roses, iris, etc.	512
Wooden signs	36
Cardboard signs	290
Twelve inch wood labels for special plantings	36
Wooden hanging labels for trees and shrubs	334
Total	1,779

Also numerous miscellaneous numbers and signs.

Respectfully submitted,

Alfred Gundersen,
Curator of Plants.

REPORT OF THE CURATOR OF THE HERBARIUM FOR 1938

To the Director.

I submit herewith my report for the year ending December 31, 1938.

The Herbarium

Due to circumstances beyond our control, the herbarium was left last year without the services of a mounter, so that few finished herbarium specimens were added to the collection. Plans are under way for a continuation of mounting, and it is hoped that the material on hand will be mounted and inserted during the coming year. The collection is being constantly enriched by exchanges with other botanic gardens throughout the world and through gifts by universities and individuals (see list of Herbarium Accessions, p. 93). The herbarium contains a number of early American collections (1815–1840) upon which I am now working. These came chiefly from the herbarium of Stephen Calverley, an old Brooklyn resident about whom I have been able to find almost nothing. These old collections are valuable both for the specimens involved and for the light that is shed on the activities of early American scientists of this period, and on the former distribution of native flora over a region now largely occupied by city conditions, and still being encroached upon by the steady growth of the city. As a result of my collections in Tennessee during the summer of 1938, approximately 8000 specimens are added to our herbarium collection, or for exchange with other institutions.

Local Flora Section

The great need of this area, which shows plants native in the New York region growing in their natural habitats, is a series of high limestone rocks or ledges which will provide a home for plants—partly rock ferns, but including many others—absolutely restricted to this type of environment. Such limestone ledges occur in northwestern New Jersey, extending in a northeasterly direction (really an extension of the Shenandoah Valley limestones) through Orange County, New York, and across the

FIG. 8. Sketch to show proposed Limestone Ledge and Pool in Local Flora Section.

Hudson River into Dutchess County and northwestern Connecticut. The weatherbeaten rocks which compose these ledges have crevices into which our very discriminating plants may thrust their roots and obtain the necessary calcareous food materials which enable them to survive. The Local Flora Area has hitherto been developed with very little constructional expenditure, the costs having been practically confined to purchase of sand and peat for the elaboration of certain habitats. The gift of Mr. Bernhard Hoffman, of Stockbridge, Massachusetts, of one truck-load of weathered limestone boulders, recorded in our preceding report, should be recalled here with renewed expression of appreciation. This made possible a beginning of the limestone ledge, but the treatment needs to be carried out on a much larger scale in order to simulate natural conditions. Now, with the uprooting of five locust trees by the hurricane and the resulting disfigurement of the southwest corner of the area, the time seems ripe for an appeal for funds for the construction of limestone ledges, to be approximately ten feet high and located in a limited area in the shaded

southwest corner, a place admirably adapted for this purpose. For this construction, together with a small, irregular concrete pool for native waterlilies at its base (see the accompanying sketch by Miss Purdy), a sum of $1,500–$2,000 would be needed, the chief expenses being the transportation and setting up of the limestone rocks.

Herbarium Material Loaned

	Sheets
Bailey, Dr. L. H., Cornell University, Ithaca, N. Y.	1
Becker, Mr. George, Rockaway Park, N. Y.	16
Benedict, Dr. R. C., Brooklyn College	49
Drouet, Dr. Francis, Yale University, New Haven, Conn.	41
Holmes, Dr. F. O., Rockefeller Institute for Medical Research, Princeton, New Jersey	1
Long, Mr. Bayard, Academy of Natural Sciences, Philadelphia, Pa.	89
New York Botanical Garden, Bronx Park, N. Y.	2
	199

Herbarium Material Borrowed for Study

Blomquist, Dr. H. L., Duke University, Durham, N. C.	1
Cory, Mr. V. L., Texas Agricultural Experiment Station, Sonora, Tex.	10
Gaige, Mr. E. E., Hackensack, N. J.	25
Gray Herbarium, Harvard University, Cambridge, Mass.	214
Kearney, T. H. and Peebles, R. H., U. S. Department of Agriculture, Washington, D. C.	2
Krukoff, Dr. B. A., New York Botanical Garden, Bronx Park, N. Y.	37
Marquand, Mrs. Allan, Princeton, N. J.	100
Missouri Botanical Garden, St. Louis, Mo.	2
New York Botanical Garden, Bronx Park, N. Y.	538
Royal Botanic Gardens, Kew, England	13
U. S. National Museum, Washington, D. C.	25
Whetzel, Prof. H. H., New York State College of Agriculture, Ithaca, N. Y.	20
	987

Herbarium Accessions and Distribution

Phanerogamic Herbarium

Accessions:

By Gift:

Cory, Mr. V. L., Texas Agricultural Experiment Station, Sonora, Tex.	10
Cutting, Mrs. C. Suydam, New York City	70

Diddell, Mrs. W. D., Jacksonville, Fla.	1	
Drushel, Dr. J. A., New York University	120	
Hanes, Mr. C. R., Schoolcraft, Mich.	11	
Hanmer, Mr. C. C., East Hartford, Conn.	22	
Iowa State College, Ames, Ia.	3	
Jansson, Mr. K. P., Groton, Conn.	112	
Topping, Mr. D. LeRoy, Honolulu, T. H.	10	
Weatherby, Mr. C. A., Cambridge, Mass.	387	746
By Exchange:		
Bird, Mr. Henry, Rye, N. Y.	2	
Chase, Mrs. Agnes, U. S. National Herbarium, Washington, D. C.	90	
Cluj, University of, Cluj, Roumania	233	
Cornell University, Ithaca, N. Y.	30	
Demaree, Dr. Delzie, A. & M. College, Monticello, Ark.	330	
Fassett, Dr. Norman C., University of Wisconsin, Madison	105	
Field Museum of Natural History, Chicago, Ill.	1	
Gray Herbarium, Harvard University, Cambridge, Mass.	509	
Hanes, Mr. C. R., Schoolcraft, Mich.	3	
Hayden, Dr. Ada, Iowa State College, Ames, Ia.	20	
Hermann, Prof. F. J., University of Michigan, Ann Arbor	22	
Iowa State College, Ames, Ia.	65	
Lingnan University, Canton, China	62	
Missouri Botanical Garden, St. Louis, Mo.	13	
Muenscher, Prof. W. E., Cornell University, Ithaca, N. Y.	42	
Natural History Museum, Balboa Park, San Diego, Cal.	22	
New York Botanical Garden, Bronx Park, N. Y.	6	
Pennsylvania, University of, Philadelphia, Pa.	46	
Philadelphia Academy of Natural Sciences, Philadelphia	225	
St. John, Mr. Robert P., Floral City, Fla.	3	
Steyermark, Dr. Julian A., Field Museum, Chicago, Ill.	1	
U. S. Bureau of Biological Survey, Washington, D. C.	1	
U. S. National Museum, Washington, D. C.	17	
Wagner, Mr. Warren Herbert, Jr., Washington, D. C.	1	1,849
By Collection:		
Svenson, Dr. Henry K., Brooklyn Botanic Garden	8,070	
Vilkomerson, Miss Hilda, Brooklyn Botanic Garden	4	8,074
By Purchase:		
Harper, Dr. R. M., University of Alabama, University, Ala.	145	
Kittredge, Miss E. M., Vergennes, Vt.	111	256

Cryptogamic Herbarium

(*Exclusive of Fungi. See below*)

By Gift:		
St. John, Mr. Robert P., Floral City, Fla.	11	
By Exchange:		
Cluj, University of, Cluj, Roumania	17	
By Collection:		
Benedict, Dr. R. C., Brooklyn Botanic Garden	3	
Pierce, Miss Mary-Elizabeth, Brooklyn Botanic Garden	1	
By Purchase:		
Verdoorn, Franz, Leiden, Holland	50	82
Total		11,007
Distribution:		
By Exchange:		
Chase, Mrs. Agnes, U. S. National Herbarium, Washington, D. C.	45	
Correll, Dr. Donovan S., Harvard University, Cambridge, Mass.	3	
Stoudt, Mr. H. M., Johns Hopkins University, Baltimore, Md.	3	
By Gift:		
Deam, Mr. C. C., Bluffton, Ind.	1	52

Respectfully submitted,

HENRY K. SVENSON,
Curator of the Herbarium.

REPORT ON THE MYCOLOGICAL HERBARIUM, 1938

TO THE DIRECTOR:

A report on the mycological herbarium for the year 1938 is hereby submitted.

On December 31, 1938, the Mycological Herbarium consisted of approximately 79,000 specimens of fungi, which have been derived from a great variety of sources since the establishment of the Garden. The most important addition to the Herbarium was the mycological collection of Dr. Franz Bubák, Prague, Czecho-Slovakia, for many years Director of the Tabor Botanical Garden. In October 1922 the Garden purchased his entire collection of fungi, which consisted of 33,779 specimens. Several very valuable exsiccati of fungi were included, and of special value were the type specimens of more than 500 new species of fungi which

Dr. Bubák described in the course of his long mycological career.

In the Herbarium are included the following exsiccati, many of which are complete, while others lack some fascicles:

Bartholomew, E.	North American Uredinales
Brenckle, J. F.	Fungi Dakotenses
Burlingham, G. S.	Lactariae of North America
Ellis, J. B.	North American Fungi
Ellis, J. B. & B. M. Everhart	North American Fungi
Ellis, J. B., B. M. Everhart, C. L. Shear & E. Bartholomew	Fungi Columbiani
Garrett, A. O.	Fungi Utahenses
Griffiths, D.	West American Fungi
Jaap, O.	Fungi selecti
Jaap, O.	Myxomycetes
Jaczewski, A. de, W. Komarow & W. Tranzschel	Fungi Rossiae
Kabát, J. E. & F. Bubák	Fungi imperfecti
Kellerman, W. A.	Ohio Fungi
Krieger, W.	Fungi saxonici
Krieger, W.	Schädliche Pilze
Linhart, G.	Fungi hungarica
Migula, W.	Kryptogamae Germaniae, Austriae and Helvetiae
Raciborski, M.	Mycotheca Polonica
Savulescu, Tr.	Herbarium Mycologicum Romanicum
Seymour, A. B. & F. S. Earle	Economic Fungi
Shear, C. L.	New York Fungi
Sydow, P.	Fungi exotici
Sydow, P.	Mycotheca Germanica
Sydow, P.	Phycomyceten & Protomyceten
Sydow, P.	Uredineen
Sydow, P.	Ustilagineen
Tranzschel, W. & J. Serebrianikow	Mycotheca Rossica
University of Minnesota	Reliquiae Holwayanae
Vestergren, T.	Micromycetes rariores
Wilson, G. W. & F. J. Seaver	Ascomycetes and Lower Fungi
Zillig, H.	Ustilagineen Europas

Some other very important additions to the Herbarium may be mentioned:

Prof. Bruce Fink, Oxford, Ohio. 1,419 specimens.
Mr. J. M. Grant, Marysville, Wash. 210 woody fungi.
Dr. David Griffiths, Washington, D. C. 6,218 specimens.
Dr. Robert Hagelstein, Mineola, N. Y. 115 Myxomycetes of Long Island.
Mr. C. H. Hanmer, Fishers Island, N. Y. 2,705 Agarics and related forms.
Dr. H. Poeverlein, Speyer, Germany. 384 Rusts.
Mrs. Elizabeth H. Reichling, Brooklyn, N. Y. 1,294 specimens.
Dr. F. L. Tai and Dr. T. F. Yu. 111 specimens, Powdery Mildews of China.
Dr. S. Tanaka, Shizuoka, Japan. 130 specimens of Japanese Fungi.
University of California. 394 specimens.
United States Department of Agriculture, Office of Pathological Collections. 1,262 specimens.
Dr. H. H. Whetzel and Dr. E. W. Olive. 740 specimens of Porto Rican Fungi.
The Harold Wingate Myxomycete Herbarium. 155 specimens.
Dr. G. L. Zundel, State College, Pa. 70 specimens, Smuts of the United States.

During the early part of the year, Dr. L. Gordon Utter went over the collection very thoroughly and consolidated a great deal of the material which had accumulated in recent years. The various collections of a given genus are now accessible in one place in the cases.

Prof. A. J. Mix, University of Kansas, Lawrence, Kan., consulted the type specimens of Taphrina, and Prof. Charles Chupp, Cornell University, Ithaca, N. Y., examined the type specimens of certain species of Cercospora. They were especially interested in the type specimens originally described by Prof. Bubák.

Respectfully submitted,

George M. Reed,
Curator.

REPORT OF THE HORTICULTURIST FOR 1938

To the Director:

I submit herewith my report for the year ending December 31, 1938.

Personnel

The number of gardeners and laborers on the regular force has remained the same during the past three years in spite of increased work due to the installation of the Horticultural Section, the Medicinal and Culinary Garden, and the Rose Arc. Three additional trained gardeners are an urgent neecssity if the collections and grounds are to be properly maintained.

Of the twenty-two gardeners and laborers three are assigned to the Conservatories; two to the Experimental Plot; one to the Japanese Garden. Time lost to garden work from using laborers as guards amounts to 223 days; time off of gardeners in lieu of pay for Sunday duty in the Conservatories, 95 days; vacations about 290 days; and sick leave 52 days—a total of 660 days. Thus for the actual work of caring for the garden we have only about fourteen men working forty-four hours per week. This is not enough adequately to take care of more than 50 acres mostly under intensive cultivation. The work that has to be done each year includes: the erection of nearly 5000 feet of temporary wire guards to protect bulb plantings, etc.; the shearing, three times during the growing season, of over 758,000 square feet of hedge surface; the raising of plants in tens of thousands for the Conservatory Plaza, and the Horticultural and Systematic Sections; planting, pruning, digging, plowing, cultivating, and mowing; and spraying and dusting for insect and fungus pests.

Labor Paid for by Government Relief Organizations

Works Progress Administration

Junior agronomists (2) Senior laboratory technician Laborer Clerk	685 days	4,110 hours

National Youth Administration

32 youths	1,234 days	9,872 hours

Student Observers

Five young men worked as Student Observers for a total of 478 days without pay.

FIG. 9. Rose Arc, facing west. June, 1938. (9750)

Systematic Section

The area devoted to "hardy" Chrysanthemums was increased by including the grass aisle between the two beds east of the walk thus making one large bed.

The section containing the Gramineae (Grass Family) was entirely remade.

The tulip beds on both sides of the west walk were drained with tile drains and cinders, and twenty cubic yards of sand was mixed with the soil preparatory to planting with bearded iris. The tulip species were transferred to a bed to the east.

Horticultural Section

Twelve hundred Phlox subulata in variety and 1,700 miscellaneous plants were planted in the wall garden.

A heath (*Erica*) and heather (*Calluna*) bed was made by adding peat-moss and sand to the soil on the reservoir bank; and planted with 1,800 plants raised here.

The installation of architectural features required the temporary removal by our men of nearly 5,000 square feet of flagstone paving; the laying of a plank roadway, and the removal of shrubs for the passage of lifting equipment.

Border Mound

Commonplace plant material on the Border Mound was removed to make room for more interesting species (86) transferred from the nursery.

Rose Garden

Thirty-eight new varieties of Hybrid Tea roses (6 of each), and 12 Polyantha varieties (5 of each) were planted to replace discarded varieties. The collection of Climbers was enriched by eliminating some duplicates and planting 33 roses in 13 new varieties. To replace dead and unthrifty specimens 204 bushes were planted. For the above roses we are indebted to Bobbink & Atkins, Rutherford, N. J., (456 plants); Brownell Rose Research Gardens, Little Compton, R. I., (49 plants); Jackson & Perkins, Newark, N. Y. (18 plants); and Mrs. W. Sterling Peters, East Hampton, L. I., (2 plants).

The Metate was transferred from the Rose Garden to a more appropriate location in the Rock Garden.

The Garden was dusted thirty times against black spot and leaf-eating insects; and sprayed twice to control sucking insects.

Medicinal and Culinary Garden

A more interesting layout of the culinary garden was achieved by revising the original plan and installing two knots with patterns dating back to Elizabethan times. At the same time more room was made for the growth of culinary herbs.

Pests

The first Japanese beetles of the season appeared on June 13 —about ten days earlier than usual—and enormous numbers were seen during the first two weeks in July. The excessive rains in July (16 rainy days, 8 of which were in succession—17th to 24th), however, lessened their activities and the damage was not so severe as we feared it might be.

Even with aid from the weather it was necessary to spray heavily, and more than 4,000 gallons of deterrents were applied. Hoping that it might be possible to secure protection with relatively non-poisonous materials we used 1,100 gallons of aluminum sulphate and lime, and 400 gallons of tetramethyl thiuram disulphide. The first named was not very effective—partly because it did not stick well during rainy periods. Good results were obtained with the tetramethyl thiuram disulphide mixture. Another effective but poisonous spray material was lead arsenate with flour added as a "sticker." Fifteen thousand pounds of a 10% mixture of lead arsenate and sand was applied in the spring to "grub-proof" 150,000 square feet of lawn.

Scale insects necessitated the application of 1,200 gallons of dormant spray (miscible oil); and aphids, etc., required 1,200 gallons of nicotine-soap solution to keep them under control.

Wild rabbits, which are still nesting in the Garden, continue to cause much damage. The problem of controlling them under city conditions does not seem to have been solved.

Hurricane

The hurricane of September 21 did considerable damage to woody plants in the Garden. Lombardy poplars (*Populus nigra* var. *italica*) were the worst sufferers—34 being blown down for a total loss. In addition 121 had to be straightened and held with guy wires and stakes. Of those that were considered irreparable, 30 were along Washington Avenue between the service gate and the lower Washington Avenue entrance. Their loss left such bad gaps that it was decided to remove the remaining 52 trees, most of which had been blown so far out of perpendicular that their future welfare was dubious. This whole stretch except for three trees adjacent to the entrance will be replanted with young trees of the same variety next spring. In the systematic collection and elsewhere on the grounds 21 trees and 3 shrubs were uprooted so that it was impossible to save them; and 21 trees and 26 shrubs had to be straightened and guyed.

International Flower Show Exhibit

Our exhibit of a Knot Garden with Herbs was awarded a Silver Medal and a Special Prize at the twenty-fifth International Flower Show, Grand Central Palace, New York, March 14 to 19. In connection with this exhibit I prepared a Leaflet describing it.[1]

Seed and Plant Distribution

In connection with the International Seed Exchange, 1,554 packets of seeds were distributed to foreign and domestic botanic gardens and other institutions. We distributed 644 packets of seeds to members of the Botanic Garden.

Living Plants Distributed:

To Members	3,240
By gift (to public institutions)	98
By exchange	2,435
Total	5,773

[1] The Brooklyn Botanic Garden exhibit of a knot garden with herbs. *Brooklyn Botanic Garden Leaflets.* Ser. 25. no. 1. March, 1938.

FIG. 10. Hurricane Damage to Hedge of Lombardy Poplars along Washington Ave. The trees fell to the southeast. Photographed September 22, 1938. (9766)

Requests for Information

Gardening information on request was supplied as follows:

By telephone	411
In person	120
By letter	450

In 1932 the figures were:

By telephone	181
In person	128
By letter	190

Courses of Instruction

I conducted the following "Courses for Members and the General Public" at the Botanic Garden:

Planning and Planting.—Two lectures in a course of five with Miss Helen Swift Jones.

Plants in the Home: How to grow them.—Five talks with demonstrations.

Personal Activities

I continued to serve on the Advisory Council for the course in Ornamental Horticulture given at the State Institute of Applied Agriculture, Farmingdale, Long Island; on the Board of Directors of the American Rock Garden Society; on the Lily Committee of the American Horticultural Society; on the Program Committee of the Radio Garden Club. I was appointed to the Label Committee of Hortus Inc., and the Leaflet Committee of the American Rock Garden Society. I acted as Consultant for the Federated Garden Clubs of New York State, Inc.

I acted as a Judge at the International Flower Show on March 14 for the Federated Garden Clubs of New Jersey; and for the Garden Club of America on March 17. On June 20 I aided in judging the Lily Show of the Horticultural Society of New York, and on October 25 the exhibit of Berried Shrubs held by the Long Island Horticultural Society at Farmingdale, Long Island. I was also one of the judges on December 16 in the Garden Contest sponsored by the Woman's Home Companion.

Respectfully submitted,

Montague Free,
Horticulturist and Head Gardener.

REPORT ON THE LIBRARY FOR 1938

To the Director.

I submit herewith my report for the year ending December 31, 1938.

Accessions

The collections at present comprise 37,692 pieces, of which number 20,543 are volumes and 17,149 are pamphlets, an increase of 815 volumes and 682 pamphlets, or 1,497 pieces during 1938. Volumes purchased totaled 182. Gifts during the year were 74 volumes, 390 pamphlets, and 736 parts. The list of donors is included in Appendix I.

Of periodicals and other serials the library received 771 as exchanges, 84 as gifts, 149 as purchases, and 6 through publication by the Garden, making a total of 1,010 titles.

List of some important accessions

Bentham, George. The Botany of the voyage of H.M.S. Sulphur during the years 1836–42. London, 1844–46.

Candolle, A. P. de and A. de. Monstruosités végétales. Premier fascicule (all published). [Neuchatel, 1841.]

Columella, L. J. M. De Re rustica . . . libri XIII. Lugduni, Seb. Gryphium, 1537.

Cooke, M. C. Vegetable wasps and plant worms. London, 1892.

Gaertner, Joseph and K. F. Gaertner. De fructibus et seminibus plantarum. Stutgard, 1788–1807. 3 vols.

Gray, Asa. Phanerogamia . . . (Wilkes, Charles. U. S. exploring expedition). Text and atlas. New York, 1854–1857.

Plumier, Charles. Nova plantarum americanarum genera. Paris, 1703.

Pringsheim, Nathanael. Zur Kritik und Geschichte der Untersuchungen über das Algengeschlecht. Berlin, 1856.

Sharrock, Robert. History of the propagation and improvement of vegetables by the concurrence of art and nature . . . Oxford, 1660.

Sprengel, C. K. Das Entdeckte Geheimniss der Natur im Bau und in der Befruchtung der Blumen . . . Berlin, 1793.

Steudel, E. G. Nomenclator botanicus . . . Stuttgart, 1840–41. 2 vols.

Willstätter, Richard and Stoll, Arthur. Untersuchungen über Chlorophyll . . . Berlin, 1913

Library Work

Revision of the scheme of classification was completed and the reclassifying of the library collections begun and carried through to about two-thirds of completion. As explained in last year's annual report the major divisions of the classification were retained but consolidation was effected so that now everything on a subject, such as entomology, is in one place. In the former classification some books on entomology were in the division for nature study, some in zoology, some in plant pathology, others in the division for farm pests. In effect the old classification consisted of three classifications—the main classification of the botanical books utilizing a decimal scheme which was especially compiled for the use of the library, preceded by a classification of reference, biography, and travel books all of which were in the "Q" collection, and followed by the "Z" classification of non-botanical books which utilized the Dewey decimal classification scheme preceded by the letter Z.

The revised scheme consolidates these three schemes into one. In addition to the classifications in use by the main library there was a fourth, the straight Dewey scheme used in classifying the books in the Children's Club Room library. The books in this collection will also be reclassified so that eventually there will be only one classification scheme in use for all the books.

In any specialized collection of books such as one on botany, there exist groups of books which form minor collections. Such are the Pre-Linnean and Linnean collections. These were assigned classification numbers in the old classification but were never kept in their relative location on the shelves. Being special collections there is no need to incorporate these books in the main classification scheme. The books in the Linnean collection which consists of works by Linnaeus, works based on the Linnean system and works about Linnaeus, were reclassified according to the arrangement in the *Catalog of the works of Linnaeus . . . in the libraries of the British Museum. 2d ed. 1933.* The British Museum catalog has been described as "the most complete review of the writings of or on Linnaeus which exists." The serial number assigned a work in that catalog was used prefixed by the letter "L" to indicate Linnean collection. In this way the dif-

ferent editions are kept together and by using the British Museum catalog as a finding list the relation of the editions to each other is readily determined. The Pre-Linnean collection will be treated similarly by substituting an alphabetical arrangement by author for the present classified arrangement. Location in the locked cases will be indicated by an asterisk.

Binding still remains the greatest need of the library. This year's statistics show 508 periodical volumes bound. Last year's showed none. With over one thousand periodicals received yearly this means that only one third of the yearly receipts are permanently protected by binding from the wear and tear and danger of loss of parts that exists when the makeshift of tying up and shelving a volume in parts is resorted to. The binding needs of the library were stressed in a talk before a group brought together by the Library Committee of the Woman's Auxiliary of the Garden.

Provision for adequately filing the *Index Algarum* and the Torrey Club *Index to American Botanical Literature* cards was effected by the purchase of two filing cabinets containing a total of 150 trays. These cabinets were secured second-hand at one fourth the price quoted for supplying new cabinets.

For the Spring Inspection in May, an exhibition of the eleven original flower paintings by Mrs. Ellis Rowan, which were presented in 1937 by Mrs. Henry McKeen Ferriday, was arranged. Through the courtesy of Mr. Schniewind, Curator of Prints and Librarian of the Brooklyn Museum, a loan of frames and a backdrop for the paintings was secured. The exhibition was kept on display for over a month and received much favorable comment.

A record of additions to the library's collection of periodicals since 1932, the date of the last *Supplement to the Union List* of serials in libraries of the United States and Canada, was forwarded to the editorial board of that publication for inclusion in the contemplated new edition. The *Union List* is the most useful tool for the location of publications needed on interlibrary loan.

Interlibrary Loans

Books were loaned to: Boyce Thompson Institute, Yonkers, N. Y.; Brooklyn Museum; Brown University, Providence, R. I.; Carnegie Institution of Washington, Dept. of Genetics, Cold

Spring Harbor, L. I.; Chilean Nitrate Education Bureau, New York; Columbia University, New York; Long Island College of Medicine, Brooklyn; Massachusetts State College, Amherst, Mass.; New Jersey Public Library Commission, Trenton, N. J.; New York State College of Agriculture, Ithaca, N. Y.; New York University, Washington Square and University Heights; Rockefeller Foundation, New York; Rockefeller Institute for Medical Research, New York and Princeton, N. J.; University of Wisconsin, Madison, Wisc.

Books were borrowed from: American Museum of Natural History, New York; Arnold Arboretum, Jamaica Plain, Mass.; Brooklyn Public Library; Columbia University, New York; Massachusetts Horticultural Society, Boston, Mass.; New York Botanical Garden; Yale University, New Haven, Conn.

The statistical report follows.

Respectfully submitted,

WILLIAM E. JORDAN,
Librarian.

STATISTICAL REPORT ON THE LIBRARY

ACCESSIONS

	Autograph Letters	Portraits	Volumes	Pamphlets	Parts (Including Periodicals)
Exchange	0	0	51	212	4,086
Gift	2	17	74	390	736
Publication	0	0	0	78	50
Purchase	3	4	182	2	1,065
By binding	0	0	508	0	0
Total	5	21	815	682	5,937

Total number of volumes in library, December 31, 1937	19,728
Number of volumes added during 1938	815
Total number of volumes in library, December 31, 1938	20,543
Total number of pamphlets in library, December 31, 1937	16,467
Number of pamphlets added during 1938	682
Total number of pamphlets in library, December 31, 1938	17,149
Total number of volumes and pamphlets in library, December 31, 1937	36,195
Net increase of volumes and pamphlets during 1938	1,497
Total number of volumes and pamphlets in library, December 31, 1938	37,692

American Fern Society Collection

Number of volumes, December 31, 1937	43
Number of volumes added during 1938	1
Total number of volumes, December 31, 1938	44
Number of pamphlets, December 31, 1937	256
Number of pamphlets added during 1938	26
Total number of pamphlets, December 31, 1938	282
Number of parts added during 1938	15

Serials and Periodicals

(Including only those of which numbers were received in 1938)

Subscription	149
Gift	84
Exchange	771
Publication	6
Total	1,010

Cataloging

Books, Pamphlets, and Serials catalogued	1,102
Total number of cards typewritten and filed	2,046

Printed Cards

Torrey Botanical Club index cards on file, December 31, 1937	53,294
Filed during 1938	1,727
Total, December 31, 1938	55,021

Miscellaneous

Number of users of the library	4,331
Books lent to members of the staff	1,129
Books lent to other institutions	68
Books borrowed from other institutions	26

REPORT OF THE RESIDENT INVESTIGATOR (FERNS) FOR 1938

To the Director:

I submit herewith my report for the year ending December 31, 1938.

School Service

During the year, some ten years as Chairman of the Program Committee of the New York Association of Biology Teachers

were completed. Because of length of service, the press of regular assignments, and also because of ill health, I withdrew as Chairman of the Committee, but have continued as a member. During the spring months, I served again as advisor of the Association's Seminar Program Committee which met several times at the Botanic Garden, making plans for the November meeting in which several high school teachers were the speakers. The program was announced as under the auspices of the "Benedict Seminar Committee."

I have continued as college representative for Biology on the Science Council of the New York City High School System.

In February, the Macmillan Company published "High School Biology" (724 pages and many illustrations), by R. C. Benedict, W. W. Knox, and G. K. Stone. Many of the illustrations are credited as by "Courtesy of Brooklyn Botanic Garden."

Editorial Work

The American Fern Journal has completed its 28th volume. Early in 1939, I shall have completed my 29th year as one of its editors.

Plant Conservation

Beginning at least as early as 1921, the Botanic Garden, through the publication of special conservation *Leaflets* and other articles, has been a center for the dissemination of information on this subject. Furthermore, as one experimental method of promoting the preservation of rare plants, several cultures of hart's-tongue fern have been raised from spores and distributed at a nominal cost, for use in outdoor fern gardens and in naturalization tests.

Another culture of hart's-tongue was distributed during 1938. To numerous inquiries as to conservation literature, a negative answer has had to be given, owing to the exhaustion of the supply of printed matter; the *Leaflets* on the subject are all out of print.

Respectfully submitted,

Ralph C. Benedict,
Resident Investigator (Ferns).

REPORT OF THE RESIDENT INVESTIGATOR (ECONOMIC PLANTS) FOR 1938

To the Director:

I herewith submit a report of the activities of the Resident Investigator for Economic Plants during 1938. With the consent of the Garden, the Brooklyn Botanic Garden-Long Island University Course (B–15, 16) in Economic Plants, was omitted during the 1938–1939 academic year. As the representative of the Brooklyn Botanic Garden and of Long Island University on the Advisory Committee on Medicinal Plants, it was particularly gratifying to realize the materialization of the herb garden project during the current year. With the formal opening on September 27, 1938, of the new section on medicinal and culinary herbs, the Brooklyn Botanic Garden has added a very instructive unit in the field of economic plants. This development will be not only of direct importance to the students in nursing and pharmaceutical science but will help to popularize many culinary uses in the home. The service of the Garden to the general public has been extended very effectively by the addition of this new unit of economic plants.

Reports on research, lectures, and publications are given elsewhere in the Annual Report under their respective headings.

Respectfully submitted,

Ralph H. Cheney,
Resident Investigator (Economic Plants).

REPORT OF FIELD SECRETARY FOR FIRST HALF OF 1938

To the Director:

In January the Woman's Auxiliary sponsored the most ambitious benefit they have undertaken. Mrs. Constance Spry, English authority on flower decoration, came from London to give two lectures. The first lecture, followed by a luncheon, was held on the Starlight Roof of the Waldorf-Astoria and was attended by five hundred club members. The second lecture, held in the auditorium at the Garden, was followed by a reception in Mrs. Spry's honor. The $1300.00 raised by these benefit lectures

was contributed to the work of the Elementary Education Department to establish an endowment fund.

Helen Swift Jones, landscape architect and member of the Auxiliary, was guest speaker, collaborating with Mr. Free, in a very delightful course on Planning and Planting the Small Place, which was presented at the Garden during February.

The Library Committee held its first tea meeting for members of the Auxiliary in April, with an exhibit of some of the library treasures and short addresses by Mr. Jordan and Dr. Gager.

In cooperation with Mr. A. V. S. Olcott, President of the Hudson River Day Line, a Wild Flower Trip to Indian Point was undertaken on Friday, May 20. Members of the Garden staff and those of other botanical institutions acted as guides for the trip, which was taken on one of the Day Line boats. This entailed considerable organizing and the circularizing of many groups as well as the Garden membership.

Five hundred letters and a number of reviews were sent out during the spring months to stimulate the sale of John Evelyn's *Acetaria,* reprinted last year by the Auxiliary. About 400 copies of the book have been sold and the Auxiliary has been gratified by the many commendations received. It has been a satisfaction that the sale of the book has defrayed the rather heavy expenses of reprinting this quaint volume.

In April the Auxiliary made plans for the celebration of the 25th anniversary of the children's work, which was celebrated in November. An announcement of the Endowment Fund plans was made by an appeal sent out in May telling of the Children's Garden and its work and the need for adequate endowment.

These activities combined to make the early months of the year exceptionally busy, and the bulk of mailing from my office was unusually large. Assistance extended to Mrs. Spry in caring for the many requests and inquiries about her lecture program consumed much time during February and March. In addition, letters were sent to several hundred prospective members and to members in arrears, as well as the usual circularizing of special lists for the spring Garden classes. The spring folder of classes was prepared in time for distribution at the International Flower Show, and an appeal folder and the anniversary booklet of the children's work were published during May.

I addressed a number of meetings on subjects relating to the Garden on Long Island, New Jersey, and elsewhere, as well as in Brooklyn, including two sessions on Flower Arrangement in Blacksburg, Virginia, during the Garden Institute held by the Virginia Federation of Garden Clubs and the Virginia Polytechnic Institute.

The position of Field Secretary was discontinued as of August 1, 1938.

Respectfully submitted,

GERTRUDE W. MERRILL,
Field Secretary.

FINANCIAL STATEMENT FOR 1938

I. Tax Budget Accounts

Code No.	*Account*	*Appropriated*	*Expended*	*Balance Dec. 31, 1938*	*Balance to Code Number*
	Personal Service				
1530	Regular Employees	$63,625.20	$63,625.20	$0.00	
1531	Temporary Employees	17,500.00	17,500.00	0.00	
	Total Personal Service	$81,125.20	$81,125.20	$0.00	
	Other Than Personal Service				
1532	Fuel Supplies	*$ 4,000.00	$ 3,993.17	$6.83	
1533	Office Supplies	675.00	675.00	0.00	
1534	Laundry, Clean. & Dis. Sup.	200.00	200.00	0.00	
1535	Bot. & Agric. Supplies	2,800.00	2,800.00	0.00	
1536	Motor Vehicle Supplies	* 75.00	75.00	0.00	
1537	General Plant Supplies	200.00	200.00	0.00	
1538	Office Equipment	150.00	150.00	0.00	
1539	General Plant Equipment	2,300.00	2,300.00	0.00	
1540	General Plant Materials	1,400.00	1,400.00	0.00	
1541	Repairs and Replacements	2,000.00	2,000.00	0.00	
1542	Telephone Service	500.00	460.88	39.12	† $28.24 to 1543–44
1543	Carfare	50.00	61.73	0.00	
1544	Expressage and Deliveries	200.00	216.51	0.00	
1545	General Plant Service	400.00	400.00	0.00	
1546	Contingencies	50.00	50.00	0.00	
	Total Other Than Personal Service	$15,000.00	$14,982.29	$17.71	
	Total Expended		$96,107.49		
	Balance, Dec. 31, 1938			$17.71	
1532*	Transferred to Department of Purchase, General Purchase Fund				$4,000.00
1536*	" " " " " " " "				75.00

† Subject to the action of the Director of the Budget of the City of New York

II. Private Funds Account

Permanent Funds (Restricted)	*Principal*	*Balance Jan. 1, 1938*	*Income*	*Available*	*Expended*	*Balance Dec. 31, 1938*
1. Endowment Fund	$ 50,500.00	$ 0.00	$ 1,767.48	$ 1,767.48	$ 1,767.48	$ 0.00
2. Life Membership	7,100.00	0.00	266.00	266.00	266.00	0.00
3. George C. Brackett	500.00	0.00	17.48	17.48	17.48	0.00
4. Benjamin Stuart Gager	13,417.20	74.15	469.60	543.75	515.72	28.03
5. Martha Woodward Stutzer	10,000.00	54.15	350.00	404.15	403.95	.20
6. Mary Bates Spalding	2,697.00	204.24	94.36	298.60	35.12	263.48
7. Alfred T. White	243,149.27	0.00	8,510.24	8,510.24	8,510.24	0.00
8. A. Augustus Healy Bequest	9,798.31	0.00	342.92	342.92	342.92	0.00
9. Robert B. Woodward	25,000.00	0.00	875.00	875.00	875.00	0.00
10. Endowment Increment	143,028.05	0.00	4,900.39	4,900.39	4,468.53	431.86
11. A. T. White Memorial Tablet	3,889.85	0.00	136.12	136.12	136.12	0.00
12. Bklyn Inst. Centennial	30,000.00	0.00	1,050.00	1,050.00	1,050.00	0.00
13. John D. Rockefeller, Jr.	250,000.00	0.00	8,750.00	8,750.00	8,750.00	0.00
14. Citizens' Endowment	253,929.26	0.00	8,887.51	8,887.51	8,887.51	0.00
15. Henry W. Healy Trust	53,660.92	83.20	1,456.56	1,539.76	1,503.36	36.40
16. Mrs. H. C. Folger	1,000.00	47.62	35.00	82.62	50.00	32.62
17. John W. Frothingham	10,000.00	0.00	392.20	392.20	392.20	0.00
18. F. E. W. Fund	250,000.00	2,024.26	8,750.00	10,774.26	10,648.45	125.81
19. Ellen Eddy Shaw Endowment	8,526.80	0.00	0.00	0.00	0.00	0.00
20. Herbarium Endowment	2,195.04	0.00	0.00	0.00	0.00	0.00
Total	$1,368,391.70	$ 2,487.62	$ 47,050.86	$ 49,538.48	$ 48,620.08	$ 918.40
Special Accounts (Restricted)						
21. Sustaining Membership		183.26	533.13	716.39	666.41	49.98
22. Annual Membership		511.91	4,053.00	4,564.91	4,471.62	93.29
23. Tuition and Sales		3,346.10	12,577.00	15,923.10	12,363.59	3,559.51
24. Collections Fund		43.94	3,493.80	3,537.74	3,074.83	462.91
25. Cary Library Allotment		28.04	70.00	98.04	89.41	8.63
26. Special Purposes		7,373.05	37,016.68	44,389.73	36,333.03[1]	8,056.70
27. Plant Pathology Research		0.00	4,000.00	4,000.00[2]	4,000.00[2]	0.00
28. Special Contributions		236.38	690.12	926.50	9.23	917.27
Total		$11,722.68	$ 62,433.73	$ 74,156.41	$ 61,008.12	$13,148.29
Grand Total	$1,368,391.70	$14,210.30	$109,484.59	$123,694.89	$109,628.20	$14,066.69

[1] Including $6331.77 transferred to Principal, line 19.
[2] Not including $2500.00 from line 18.

III. Summary of Total Maintenance Budget for 1938

		Income			*Expended*			
		Personal Service	*Other than Personal Service*	*Total*	*Personal Service*	*Other than Personal Service*	*Total*	*Balance Dec. 31, 1938*
Tax Budget Appropriation	43.73%	$ 81,125.20	$15,000.00	$ 96,125.20	$ 81,125.20	$14,982.29	$ 96,107.49	$ 17.71
Private Funds Budget	56.27%	58,241.58	65,453.31	123,694.89	57,324.31	52,303.89	109,628.20	14,066.69
Totals		$139,366.78	$80,453.31	$219,820.09	$138,449.51	$67,286.18	$205,735.69	$14,084.40

Respectfully submitted,

Daniel C. Downs,

Secretary and Accountant.

Note: The above "Financial Statement" is a transcript of Brooklyn Botanic Garden accounts in the books of the Treasurer of The Brooklyn Institute of Arts and Sciences. The Treasurer's accounts are audited annually by a Public Accountant, and a separate audit of this "Financial Statement" is not made in order to save unnecessary expense.

Edwin P. Maynard,

Treasurer.

APPENDIX I

GIFTS RECEIVED DURING 1938

Collections Fund *

Mrs. Frank L. Babbott
Battle Pass Chapter D. A. R.
Philip A. Benson
Miss Dorothy Betts
Frank D. Brown
Mrs. Armin E. Brunn
Mrs. Glentworth R. Butler
Mrs. S. Parkes Cadman
Mrs. Francis T. Christy
W. R. Coe
Mrs. Walter V. Cranford
Otto Ebel
Mrs. William Emerson
Mrs. Lewis W. Francis
Garden Club of Port Washington
Mrs. J. Morton Halstead
Mrs. A. Augustus Healy
Miss Margaret Helburn
William T. Hunter
Miss C. Julie M. Husson
Mrs. Raymond V. Ingersoll
Edward A. Ingraham
Miss Frances T. Ingraham
William L. James
Miss Jeanetta C. Jameson
Mrs. P. Chalmers Jameson
Morris Katz
George W. Koerner
Miss Hilda Loines
Mrs. Stephen Loines
Mrs. George Lyons
Mrs. William W. Marshall
Alfred E. Mudge
Mrs. Frederic C. Paffard
Mrs. James Post
Mrs. Frederic B. Pratt
Harold I. Pratt
Mrs. Benjamin Prince
Mrs. William A. Putnam
Alonzo B. See
Mrs. J. Sheridan
Miss Elise W. Stutzer
Miss Alice W. Titus
"C. W."
Westhampton Garden Club
Alain White
Mrs. Alexander M. White
Miss Harriet H. White
Women of '76 Chapter N. S. D. A. R.
Peter Piper Wright

Architectural Features of the Long Green

Mrs. Dean C. Osborne, Executrix, Toward Architectural Features, Horticultural Section $25,000.00

Flower Show Exhibit

International Exposition Company 350.00

Special Gifts for Children's Work

Anonymous 60.00

* *Note.*—Contributions to the Brooklyn Botanic Garden constitute proper deductions under the Federal Income Tax Law.

Ellen Eddy Shaw Endowment Fund

Through the Woman's Auxiliary (from several hundred contributors)	6,148.77
The Elin A. L. Wikander Bequest	2,195.03

Herbarium Endowment Fund

The Elin A. L. Wikander Bequest	2,195.04

Japanese Garden

Mrs. Amy B. Burgess	5.00

Library

Books

Beers, Dr. Nathan T., Brooklyn, N. Y.	2
Benedict, Dr. Ralph Curtiss, Brooklyn, N. Y.	1
Botanic Garden of D. B. W., Visby, Sweden	1
Botanischer Garten, Dortmund-Brunninghausen, Germany	1
Brooklyn Botanic Garden Woman's Auxiliary	1
Christy, Mr. Francis T., New York, N. Y.	1
Cork Institute of America, New York, N. Y.	1
Cotton, Mr. Charles H., Brooklyn, N. Y.	3
Evans, Hon. Marcellus H., Washington, D. C.	1
Free, Mr. Montague, Brooklyn, N. Y.	2
Gager, Dr. C. Stuart, Brooklyn, N. Y.	31
Gauvreau, Miss Marcelle, Montreal, Canada	1
Hitchcock, Dr. Albert Spear, Estate of, Washington, D. C.	2
Iowa State College Library, Ames, Iowa	3
Japanese Government Railways, Board of Tourist Industry, Tokyo	6
Knoche, Dr. Herman, San José, Cal.	1
Lenin Academy of Agricultural Sciences, Institute of Plant Industry, Leningrad, U. S. S. R.	4
Linnean Society of London, London, Eng.	1
Melander, Prof. Axel Leonard, New York, N. Y.	1
Miner, Miss Frances M., New York, N. Y.	1
New York Public Library	1
Pratt Institute Free Library, Brooklyn, N. Y.	2
Svaz Zemskych Ustredi vcelarskych spolku CSR, Praha II, Czecho	1
Thatcher, Mr. Edwin H., Brooklyn, N. Y.	3
Total	72

PAMPHLETS

Albaum, Dr. H. G., Brooklyn, N. Y.	2
Aufrère, Dr. Georges, Aurillac, Cantal, France	3
Benedict, Dr. Ralph Curtiss, Brooklyn, N. Y.	2
Boron Agricultural Bureau, London, Eng.	3
Cheney, Dr. Ralph Holt, Brooklyn, N. Y.	1
Chodat, Prof. Fernand, Geneva, Switzerland	1
Cook, John, Inc., Baltimore, Md.	1
Dafrose, Sister M., Brooklyn, N. Y.	1
DeFina, Mr. A. L., Buenos Aires, Argentina	1
Doney, Mr. Charles F., Brooklyn, N. Y.	1
Dreer, Henry A., (Seedsman), Philadelphia, Pa.	1
DuPont de Nemours & Company, Wilmington, Del.	1
Fischer, Dr. Bernhard, Vienna, Austria	3
Fischer, Dr. Hans, Munich, Germany	1
Fosberg, Mr. F. R., Philadelphia, Pa.	1
Francis, Mrs. Lewis W., Brooklyn, N. Y.	8
Free, Mr. Montague, Brooklyn, N. Y.	3
Gager, Dr. C. Stuart, Brooklyn, N. Y.	215
Gauvreau, Miss Marcelle, Montreal, Canada	1
Graves, Dr. Arthur Harmount, Brooklyn, N. Y.	5
Gundersen, Dr. Alfred, Brooklyn, N. Y.	2
Harper, Dr. Roland M., University, Ala.	3
Harvard Forest, Petersham, Mass.	1
Hoag, Mrs. J. Edward, Brooklyn, N. Y.	1
Huntington, Henry E., Library and Art Gallery, San Marino, Cal.	1
International Horticultural Congress, 12th, Berlin, Germany	1
Kyoto Botanic Garden, Kyoto, Japan	3
Lager and Hurrell, Summit, N. J.	1
Lemée, M. Albert, Rennes, Ille-et-Vilaine, France	1
Mahoney, Mr. W. H., New York, N. Y.	1
Mellon Institute of Industrial Research, Pittsburgh, Pa.	7
Moldenke, Dr. Harold N., New York, N. Y.	1
Montani, Dr. Angelo, Genoa, Italy	2
Muszynski, Prof. Jan, Wilno, Poland	14
New Jersey Federation of Shade Tree Commission, Kearny, N. J.	1
Nilsson, Dr. Heribert, Lund, Sweden	2
Pennsylvania, University of, Library, Philadelphia, Pa.	1
Rockefeller Institute for Medical Research, New York, N. Y.	14
Rothert, Mr. Otto A., Louisville, Ky.	1
Rothamsted Experimental Station, Harpenden, Herts, Eng.	3
Royal Consulate General of Sweden, New York, N. Y.	1
St. John, Dr. Harold, Honolulu, Hawaii	4
Sanford, A. F. Arboretum, Knoxville, Tenn.	1
Sirks, Dr. Marius Jacob, Groningen, Holland	4

Smith, Miss Helen M., Winter Park, Fla.	1
Stanley, Dr. W. M., Princeton, N. J.	21
Szymkiewicz, Prof. Dezydery, Lwow, Poland	15
Vargas C., Dr. Caesar, Cuzco, Peru	1
Wright, Mr. B. H., Lakeland, Florida	1
Zillig, Dr. Hermann, Berncastel-Cues, Mosel, Germany	12
Total	377

Parts of Publications

(Exclusive of Government Documents)

American Fern Society	10
American Horticultural Society, Washington, D. C.	4
Ames, Prof. Oakes, Cambridge, Mass.	17
Bailey, Prof. Liberty Hyde, Ithaca, N. Y.	2
Bernice P. Bishop Museum, Honolulu, Hawaii	1
Bird Lovers' Club of Brooklyn	1
Boron Agricultural Bureau, London, Eng.	1
Botanic Garden Syndicate, Cambridge, Eng.	1
Carnegie Institution of Washington, Washington, D. C.	9
Clarkson, Mrs. R. E., Milford, Conn.	10
Colorado Scientific Society, Denver, Col.	1
Commissioners of Public Parks, New Haven, Conn.	1
Committee on the Relation of Electricity to Agriculture, Chicago, Ill.	1
Dafrose, Sister M., Brooklyn, N. Y.	1
Davey Tree Expert Company, Kent, Ohio	16
DuPont de Nemours & Company, Inc., Wilmington, Del.	10
Fisher Scientific Company, Pittsburgh, Pa.	1
Fosberg, Mr. F. R., Philadelphia, Pa.	2
Francis, Mrs. Lewis W., Brooklyn, N. Y.	1
Free, Mr. Montague, Brooklyn, N. Y.	21
Gager, Dr. C. Stuart, Brooklyn, N. Y.	64
Garden Club of New Jersey, Plainfield, N. J.	2
Graves, Dr. Arthur Harmount, Brooklyn, N. Y.	27
Hawaiian Academy of Science, Honolulu, Hawaii	3
Hawaii, University of, Honolulu, Hawaii	2
Herb Society of America, Boston, Mass.	1
Hoehne, Dr. F. C., Sao Paulo, Brazil	1
Hortus, Inc., New York, N. Y.	1
Illinois Audubon Society, Chicago, Ill.	1
Jenkins, Mr. Charles F., Germantown, Philadelphia, Pa.	4
Lemmon, Mr. Robert S., New Canaan, Conn.	9
McFarland, J. Horace Company, Breeze Hill, Harrisburg, Pa.	3
Medical Society of the County of Kings, Brooklyn, N. Y.	13

Merrill, Dr. Elmer D., Jamaica Plain, Mass.	1
Missouri Resources Museum, Jefferson City, Mo.	1
Morris Arboretum, University of Pennsylvania, Philadelphia, Pa.	3
Mount Desert Island Biological Laboratory, Mount Desert, Me.	1
National Research Council, Washington, D. C.	3
National Research Council of Japan, Tokyo, Japan	2
New York Association of Biology Teachers, New York, N. Y.	8
Pennsylvania, University of, Library, Philadelphia, Pa.	5
Perkins, Mrs. Charles E., Brooklyn, N. Y.	19
Reed, Dr. George M., Brooklyn, N. Y.	56
Rothamsted Experimental Station, Harpenden, Herts, Eng.	1
Royal Agricultural Society, Cairo, Egypt	1
St. John, Dr. Harold, Honolulu, Hawaii	2
School Garden Association, New York, N. Y.	7
School Garden Association of America, Cleveland, Ohio	1
School Nature League, New York, N. Y.	10
Shaw, Miss Ellen Eddy, Brooklyn, N. Y.	1
Société Francaise des Chrysanthémistes, Lyon, France	4
Squibb Institute for Medical Research, New Brunswick, N. J.	1
Towson Nurseries, Inc., Towson, Md.	3
Von Lehn, Mrs. Richard, Brooklyn, N. Y.	18
West Virginia University, Herbarium, Morgantown, W. Va.	3
Yale University, School of Forestry, New Haven, Conn.	4
Total	397

Portraits and Photographs

Oak, Miss Dorothy, New York, N. Y.	8
Overton, Mrs. J. B., Santa Monica, Cal.	1
Peirce, Prof. George J., Palo Alto, Cal.	2
Simonet, M., Cap d'Antibes, France	4
Trotter, Prof. A., Portici, Naples, Italy	2
Total	17

Autograph Letters

Gager, Dr. C. Stuart, Brooklyn, N. Y.	2

Miscellaneous

Gager, Dr. C. Stuart, Brooklyn, N. Y. Miscellaneous historical and descriptive material on the Brooklyn Botanic Garden.

Voris, Miss Maude E., Brooklyn, N. Y. 1 print of the Department of Agriculture Building, Washington, D. C. circa 1870.

Department of Plants

Living Plants

Auten, Mr. Edward, Jr., Princeville, Illinois, 2 plants of *Aesculus glabra* var. *Sargentii.*

Bell, Miss Mary, Bayside, L. I., 1 clump of *Convallaria majalis* var. *rosea.*

Bernhardt, Dr. Abraham, Brooklyn, N. Y., 1 *Thea sinensis.*

Bird, Mr. Henry, Rye, N. Y., 1 *Sarracenia flava* from N. Carolina.

Bobbink & Atkins, Rutherford, N. J., 435 roses in 50 varieties.

Brakkee, Mr. Harry F., Brooklyn, N. Y., 1 *Cereus* sp.

Brownell Rose Research Gardens, Little Compton, R. I., 49 roses including 12 climbers and 3 hybrid teas.

Bullard, Mr. H. O., Hackensack, N. J., 18 species of succulents.

Chanler, Mrs. Alice, Huntington, L. I., 7 plants and cuttings.

Clark, Mr. Harry H., New York, N. Y., 1 cypress stump with epiphytes.

Crabtree, Mr. J. A., Montgomery, N. Y., 1 clump of *Viola.*

Cutting, Mrs. C. Suydam, New York, N. Y., 197 plants in 14 species from Tibet.

Delafield, Mrs. John R., New York, N. Y., 1 *Hatiora salicornioides.*

Diddell, Mrs. W. D., Jacksonville, Fla., 1 *Ophioglossum* sp.

Dillmann, Mr. George, Pawling, N. Y., 1 *Geranium maculatum album.*

Drake, Mr. Oliver D., Englewood, N. J., 3 species of *Cactaceae.*

Fox, Mrs. Mortimer J., New York, N. Y., 2 herbs.

Garden-in-the-Woods, So. Sudbury, Mass., 9 plants including 8 species of herbs.

Greenberg, Mrs. Veronica, Brooklyn, N. Y., 1 *Persea americana.*

Griffith, Mrs. C. P., Rochester, N. Y., 5 plants of *Asplenium.*

Hayward, Mr. Wyndham, Winter Park, Fla., 1 tuber of *Gloriosa superba.*

Hough, Col. Ira, Brooklyn, N. Y., 1 *Euphorbia splendens.*

Huntington, Mr. F. W., Boonton, N. J., 8 *Dionaea muscipula.*

Jackson & Perkins Co., Newark, N. J., 6 roses in 3 varieties.

Las Positas Nurseries, Santa Barbara, Cal., Mr. W. M. James, 77 plants comprising 3 species of *Lachenalia.*

MacGovern, Mrs. J. W., Jackson Heights, N. Y., 2 species of *Hedera.*

Oak, Miss Dorothy, New York, N. Y., 17 plants comprising 3 species of *Sarracenia.*

Osborne, Mrs. Dean C., Brooklyn, N. Y., 1 *Phoenix Roebelinii.*

Reiter, Mr. Victor, San Francisco, Cal., 4 varieties of *Fuchsia.*

Rodman, Mr. F. C., Brooklyn, N. Y., 42 bulbs of *Narcissus.*

Shore Acres Farm, Orlando, Fla., 30 plants of varieties of *Caladium.*

Taylor, Miss Venetia, Valley Stream, L. I., 1 clump of *Hepatica.*

Tricker, Mr. William, Saddle River, N. J., 42 plants comprising 18 vars. of Water Lilies.

Wagner, Mr. Max., Brooklyn, N. Y., 1 *Monotropa uniflora.*

Walther, Mr. Eric., San Francisco, Cal., 1 *Sedum Morganianum.*

White, Mr. Alain, Litchfield, Conn., 5 species of succulents, 1 *Huernia* sp., and 8 *Dionaea muscipula.*

Seed Packets

American Amaryllis Society (1)
Auten, Mr. Edward, Jr. (1)
Crane, Dr. F. W. (1)
Cutting, Mrs. C. Suydam (36)
Elliott, Rev. E. A. (5)
Jennings, A. R. (1)
Maheshwari, Dr. P. (1)
McKenny, Miss Margaret (8)
Nadler, Mr. H. (2)
Stumpp & Walter Co. (68)
Vick, Mr. Edward C. (1)
Wildfield, Mrs. V. (1)

Phanerogamic Herbarium

Cory, Mr. V. L., 10 specimens of Eleocharis from Texas.
Cutting, Mrs. C. Suydam, 70 miscellaneous specimens collected in Tibet.
Diddell, Mrs. W. D., 1 Ophioglossum from Florida.
Drushel, Dr. J. A., 120 miscellaneous specimens from Maine, New Jersey, Florida, and Texas.
Hanes, Mr. C. R., 11 specimens of Eleocharis from Michigan.
Hammer, Mr. C. C., 22 miscellaneous specimens.
Iowa State College, 3 specimens of Eleocharis.
Jansson, Mr. K. P., 112 specimens of Rubus from Connecticut.
St. John, Mr. Robert P., 11 ferns from Florida.
Topping, Mr. D. LeRoy, 10 ferns from the Hawaiian Islands.
Weatherby, Mr. C. A., 387 fern specimens.

For the Department of Elementary Instruction

Butler, Mrs. Glentworth R., One prize cup competed for by the girls in the outdoor garden.
Gager, Dr. C. Stuart, Two books for the children's clubroom library.
Goodman, Mr. and Mrs. Joseph, One cup competed for by the boys in the outdoor garden.
Hyde, Mrs. Clarence R., Seeds of gourds and of *Zea mays* for the children's garden.
Jansen, Miss Dora, Pictures of flowering bulbs for use in classwork.
New York University Class (Teaching of Elementary Science), One book for the children's clubroom library.
Perkins, Mrs. Charles E., $35.00 for motion picture films; $25.00 honorarium for children's garden work.
Shaw, Miss Ellen Eddy, Two gold honor pins for service in the outdoor garden.
Wikander, Miss Elin A. L. (By bequest), $2,195.03 for the Ellen Eddy Shaw Endowment Fund.
Woman's Auxiliary, $6,136.77 for the Ellen Eddy Shaw Endowment Fund for Children's Work. There were several hundred contributors to this fund which was raised by and under the auspices of the Woman's Auxiliary.

Miscellaneous

Mr. and Mrs. Edward D. Thurston, Jr., Sharon, Conn., 1 box of specimens of moss.

Prof. Dr. Wilhelm Troll, Halle, Germany, 4 photographs of *Carex*.

Long Island Manure Export Co., Brooklyn, N. Y., 9,100 lbs. of spent mushroom manure.

APPENDIX 2

PUBLICATIONS BY THE BOTANIC GARDEN PERSONNEL DURING 1938

Benedict, R. C.

High School Biology. (With Knox, W. W., and Stone, G. K.) The Macmillan Co. New York. February.

There is no such thing as a method of scientific discovery. *Teaching Biologist* **7**: 81–82. March.

Report of the Resident Investigator (Ferns) for 1937. *Brooklyn Bot. Gard. Record* **27**: 96–98. April.

Review of Solon Robinson: Pioneer and Agriculturist. *Journal of New York Bot. Gard.* **39**: 93. April.

Hardy Ferns at the International Flower Show. *American Fern Journal* **28**: 71–72. April–June.

Clean sod or weedy soil. *School Science and Mathematics* **38**: 552. May.

What *Osmunda* is earliest? *American Fern Journal* **28**: 121–122. July–September.

Ferns in detective fiction. *American Fern Journal* **28**: 158. October–December.

Bishop, George R.

The Sausage tree. *Nature* **31**: 21. January.

Southwest by auto. *Gardeners' Chronicle of America* **42**: 34–36. February.

Hail to Hebe. *Gardeners' Chronicle of America* **42**: 102–104. April.

Brandwein, Paul C.

The emergence of smut-inoculated oat seedlings through sand and loam soil. *Bull. Torrey Bot. Club* **65**: 477–483. October.

Cheney, R. H.

Micro-structural Changes in Muscle Fibers after Caffeine. *Biol. Bull.* **75**: 348–349. October.

Free, Montague.

Plant propagation. Horticultural Society of New York. *Monthly Bulletin.* Pp. 10–11, 14–17. February.

Xerophytes at the Botanic Garden. *Bull. Brooklyn Inst. Arts & Sciences* **42**: 211–212. February.

Brooklyn Botanic Garden Exhibit of a knot garden with herbs. *Brooklyn Bot. Gard. Leaflets.* Ser. 25, no. 1. March.

Good drainage is important. *The Sun* (New York). March 12.

Improving back-yard soils. *The Sun* (New York). March 26.

Trees for city gardens. *The Sun* (New York). April 2.

Shrubs for city gardens. *The Sun* (New York.) April 9.

Plants for the city garden. *The Sun* (New York). April 16.

Annuals for the city garden. *The Sun* (New York). April 23.

Sowing seeds out of doors. *The Sun* (New York). April 30.

Report of the Horticulturist for 1937. *Brooklyn Bot. Gard. Record* **27**: 78–81. April.

Vacation time for house plants. *Real Gardening* **1**: 17–21. May.

Constant bloom in the border. *The Sun* (New York). May 7.

New interest in Clematises. *The Sun* (New York). May 14.

Hope for the tardy gardener. *The Sun* (New York). May 21.

Our speaker today. *Real Gardening* **1**: 66–69. July.

Some neglected bulbs. *The Sun* (New York). October 22.

Another annual for the rock garden. *Gardeners' Chronicle of America* **42**: 302. November.

Free, Montague, C. Stuart Gager, and Arthur Harmount Graves.

The herb garden at the Brooklyn Botanic Garden. *Brooklyn Bot. Gard. Leaflets.* Ser. 25, no. 2–4. September.

Gager, C. Stuart

The New York State Museum: One hundred years young. (The address for botanical science at the Seventy-third

Convocation of the University of the State of New York. Celebrating the One Hundredth Anniversary of the Establishment of the Division of Science and State Museum.) Albany, N. Y. *Scientific Monthly* **46**: 71–79. January. University State of New York Bull. **No. 1143**: 23–35. July 1. (Abstract in *The Univ. State of New York Bull. to the Schools* **24**: 54–55. November.)

Edmund Boissier. [Review of Chodat, Fernand (Editor). Edmond Boissier, Botaniste Genevois, 1810–1885. Bull. Soc. Bot. Geneve. 2e Ser. 28.] *Ecology* **19**: 160. January.

Foreword. *Nature Garden Guide* of the School Garden Assoc. of New York **17**: 2. February.

Brooklyn Botanic Garden. *Official Program Internat. Flower Show* (New York). p. 95. March 14.

Pandemic botany. (Address of the retiring president of the Botanical Society of America, given at Indianapolis, Dec. 29, 1937.) *Science* **87**: 285–292. April 1.

Twenty-seventh annual report of the Brooklyn Botanic Garden, 1937: Report of the director. *Brooklyn Bot. Gard. Record* **27**: 11–36. April.

[Botany, horticulture, and botanic gardens.] Letter in *Gardener's Chronicle of America* **42**: 127. May.

Review of "An Ecological glossary," by J. Richard Carpenter. *Ecology* **19**: 480–482. July.

Botanic gardens of the world: Materials for a history. Second ed. *Brooklyn Bot. Gard. Record* **27**: 151–406. "July" [November].

Gager, C. Stuart (Arthur Harmount Graves, Montague Free, and)

The herb garden at the Brooklyn Botanic Garden. *Brooklyn Bot. Gard. Leaflets* **25**[2–4]: 1–12. Sept.

Graves, Arthur Harmount

Breeding new chestnut trees. *Report of the 28th Annual Meeting of the Northern Nut Growers Association,* Sept. 12–15, 1937. Pp. 93–100. March.

Botany. Revision service (for 1937). *Collier's National Encyclopedia.* Pp. 14–15. April.

Chestnut breeding work in 1937. *Brooklyn Bot. Gard. Record* **27**: 44–55. April.

Report of the Curator of Public Instruction for 1937. *Brooklyn Bot. Gard. Record* **27**: 58–70. April.

Resistance of chestnut to the blight. *Tree Pest Leaflets* No. 27. Pp. 1–4. Massachusetts Forest and Park Assoc., Boston, Mass. May.

Street trees. *School Nature League Bulletin* 9 (Series No. 8), 3 pp. Amer. Mus. of Nat. Hist., New York, N. Y. May.

Watch for chestnuts! *Connecticut Woodlands* **3**[3]: 36–37. Sept.

35 newspaper articles about the Brooklyn Botanic Garden.

Graves, Arthur Harmount, Montague Free, and C. Stuart Gager

The herb garden at the Brooklyn Botanic Garden. *Brooklyn Bot. Gard. Leaflets* **25**[2–4]: 1–12. Sept.

Gundersen, Alfred

Report of the Curator of Plants for 1937. *Brooklyn Bot. Gard. Record* **27**: 73–77. April.

Story of plant evolution briefly told. Illus. by Maud H. Purdy. *Natural History*. February. p. 126–127.

Delectus Seminum. *Brooklyn Bot. Gard. Record* **27**, no. 1. January.

Jordan, William E.

Report on the Library for 1937. *Brooklyn Bot. Gard. Record* **27**: 88–96. April.

Reed, George M.

Plant Pathology. *Brooklyn Bot. Gard. Record* **27**: 36–44. April.

Influence of the growth of the host on oat smut development. *Proc. Amer. Philos. Soc.* **79**: 303–326. June.

Japanese iris. The Times. July 3.

Botany. The New International Year Book, 1937: 98–100. Funk & Wagnalls Co.

Reed, George M., and T. R. Stanton

Inheritance of resistance to loose and covered smuts in Markton oat hybrids. *Jour. Agric. Res.* **56**: 159–175. February.

Shaw, Ellen Eddy

Children's work at the Botanic Garden. *Bull. Brooklyn Institute of Arts and Sciences* **42**: 171–172. January.

Education at the Brooklyn Botanic Garden in connection with the public schools. *Nature Garden Guide* **XVII.** No. 4. February.

Foreword. *Recreation* **31**: 2, 689. March.

Children's garden work in a Botanic Garden. *Recreation* **31**: 2, 691. March.

The Brooklyn Botanic Garden: its contribution to elementary science. *Proceedings* of the New York Meeting, Dept. of Science Instruction, National Education Assn. p. 29–32. June.

The window garden. *Bull. City Gardens Club.* November.

Children's work at the Brooklyn Botanic Garden. *Brooklyn Eagle.* December 19.

The following 20 articles appeared in *The Sun* (New York) on the dates indicated:

Fashion show in flowers. February 5.
Tried and true plant members for the 1938 garden. February 12.
The small vegetable garden. February 19.
Fragrance in the garden. March 5.
For the salad bowl. March 12.
The outdoor window box. April 16.
Lilies in all their glory. April 23.
Plant aster seeds in May. May 7.
More about the vegetable garden. May 14.
Tall annuals for the background. May 21.
The white garden. May 28.
Shrubs for the border. June 4.
Moving day in the garden. September 24.
A challenge for the window garden. October 1.
To be or not to be among the house plants. October 8.
The next step in window gardening. October 15.

House plants for the sunny window. October 22.
More plants of interest for the window garden. October 29.
Succulents. November 5.
Taking care of the house plants. November 12.

Svenson, Henry K.

Pteridophyta of the Galapagos and Cocos Islands. *Bull. Torrey Bot. Club* **65**: 303–333. 3 plates. May. (Reprinted as Brooklyn Botanic Garden Contributions No. 83.)

Aegilops cylindrica and *Kyllinga pumila* in the Torrey Club range. *Torreya* **38**: 72. May–June.

Carex foenea, C. straminea and *C. albicans* in Willdenow's herbarium. *Rhodora* **40**: 325–331. September.

Tilley, S. R.

Visitors to a city rose garden. *American Rose Society Annual.* Pp. 84–86.

Utter, L. Gordon

Culture and inoculation studies on races of the loose and covered smuts of oats. *Amer. Jour. Bot.* **25**: 198–210. March.

APPENDIX 3

TALKS, LECTURES, ADDRESSES AND PAPERS GIVEN BY THE BOTANIC GARDEN PERSONNEL DURING 1938

By the Director:

January 5. *Public Education at the Brooklyn Botanic Garden.* Children's Museum Auxiliary. Children's Museum, Brooklyn.

November 15. *By way of welcome.* At the first of a series of four meetings in recognition of the twenty-fifth anniversary of the Department of Elementary Instruction, and the appointment of Ellen Eddy Shaw, Curator in charge of the department. Brooklyn Botanic Garden.

November 17. *Address of welcome, with reminiscences of the calling of Miss Shaw.* At the second of four anniversary meetings, as above noted. Brooklyn Botanic Garden.

November 19. *Address of welcome.* Audience of public school teachers—the third of a series of four meetings, as above noted. Brooklyn Botanic Garden.

By the Curator of Public Instruction:

January 10. *Breeding new chestnut trees.* The Grade Teachers' Club. Hartford, Conn.

January 22. *The Chestnut in North America.* Class at the School of Education, N. Y. U. Washington Square College, New York, N. Y.

February 23. *Chestnut breeding.* Brooklyn Institute, Department of Education. Academy of Music, Brooklyn, N. Y.

March 3. *Plant propagation.* Biology Club of Alexander Hamilton High School. At the Garden.

April 4. *The fungi and plant disease. Breeding chestnut trees for disease resistance.* Horticultural Club. Franklin K. Lane High School, Brooklyn.

May 6. *Arbor Day, conservation, and forestry.* Brooklyn High School for Homemaking. At the Garden.

May 7. *Arbor Day, conservation, and forestry.* Brooklyn High School for Homemaking. At the Garden.

June 6. *Breeding new chestnut trees.* Association of Plant Breeders. Residence of Judge and Mrs. Townsend Scudder, Greenwich, Conn.

September 12. *The development of blight resistance in hybrid chestnuts.* Annual convention, Northern Nut Growers Ass'n. Horticultural Hall, Boston, Mass.

November 13. *The Brooklyn Botanic Garden.* The Sphinx Society. Flatbush Presbyterian Church.

December 9. *Breeding trees for disease resistance.* Eastern Shade Tree Conference. New York Botanical Garden.

December 13. *Making a new chestnut tree.* Horticultural Committee, Garden Club of America. New York, N. Y.

By the Curator of Elementary Instruction:

January 17. *Educational work of the Brooklyn Botanic Garden.* Principals of School Districts 36 and 37. At P. S. 140.

January 28. *Gardens.* Windsor Historical Society, Windsor, Conn.

February 1. *Graduation address.* Central Evening High School.

February 16. *Opportunities for educational work at the Brooklyn Botanic Garden.* Principals of School Districts 35 and 40. At P. S. 90.

March 1. *Spring gardening.* Women's League, Flatbush Congregational Church.

March 5. *The garden.* Pratt Institute Kindergarten Alumni. At the Waldorf Astoria.

March 9. *Educational work of the Brooklyn Botanic Garden.* Principals and Nature Curators of School Districts 43 and 44. At P. S. 63.

March 11. *Children's work at the Brooklyn Botanic Garden.* Women's University Club, New York City.

March 14. *How the Brooklyn Botanic Garden cooperates with the schools of the City.* Principals of School Districts 53 and 54, Borough of Richmond.

March 17. *A garden program for juniors.* Conference for Junior Leaders of the Federated Garden Clubs of New York State.

March 22. *Children's work at the Brooklyn Botanic Garden.* Pierrepont Tuesday Club, Church of the Saviour, Brooklyn.

April 8. *The spring garden.* Matinecock Garden Club of Glen Cove, L. I.

April 11. *The children's library at the Brooklyn Botanic Garden.* Library Committee of the Woman's Auxiliary. At the Garden.

April 12. *Nature study for boys and girls.* Parent-Teacher Association, Chatsworth Avenue School, Larchmont, N. Y.

April 28. *Garden work for boys and girls.* Nature Curator Conference. At the American Museum of Natural History.

May 2. *The Brooklyn Botanic Garden.* P. S. 134 Mothers' Club and Kindergarten. At the Garden.

May 4. *The Brooklyn Botanic Garden.* P. S. 225 Mothers' Club and Kindergarten. At the Garden.

May 12. *Nature study.* New York Branch of the American Nature Study Society. At the Garden.

May 14. *Response in appreciation of medal presentation.* Testimonial Luncheon of School Garden Association. At the Hotel Pennsylvania.

May 16. *Children's work at the Brooklyn Botanic Garden.* Brooklyn Section, Public School Kindergarten Association. At the Garden.

May 17. *The Brooklyn Botanic Garden.* P. S. 106 Mothers' Club. At the Garden.

May 19. *Facilities for nature study at the Brooklyn Botanic Garden.* Brooklyn Teachers' Association Class in Methods. At the Garden.

May 25. *The Brooklyn Botanic Garden.* Assembly, P. S. 189.

June 17. *Graduation address.* P. S. 9.

June 21. *Graduation address.* P. S. 47.

June 23. *Graduation address.* Brooklyn High School for Homemaking.

June 27. *The Brooklyn Botanic Garden and its contribution to elementary science.* Department of Science Instruction. National Education Association Meeting. At the Hotel McAlpin.

June 28. *Educational work of the Brooklyn Botanic Garden.* Department of Science Instruction. National Education Association Meeting. At the Hotel McAlpin.

October 1. *Educational work for children at the Brooklyn Botanic Garden.* Class in Elementary Science Teaching from New York University. At the Garden.

October 19. *Educational work for children at the Brooklyn Botanic Garden.* Parents' Association, P. S. 113.

October 21. *Dedication address.* P. S. 131.

October 24. *Nature study for children.* Mothers' Club, P. S. 241.

November 1. *The Brooklyn Botanic Garden.* Assembly, Brooklyn Technical High School.

November 3. *House plants.* Class from the American Museum of Natural History. At the Garden.

December 8. *Christmas customs.* P. S. 11, Queens, Parent-Teacher Association.

December 8. *Christmas myths and fables.* Assembly, P. S. 11, Queens.

December 14. *Christmas customs.* Assembly, P. S. 96, Queens.

December 14. *Christmas customs.* Assembly, P. S. 155, Queens.

December 16. *Gardening as a hobby.* Arts in Leisure Class, New York University.

By the Curator of Plant Pathology:

February 16. *Plant breeding and plant pathology.* Senior Biology Class, Brooklyn College. At the Garden.

June 24. *Japanese Iris.* Long Island Horticultural Society. At State Institute of Applied Agriculture, Farmingdale, N. Y.

October 5. *Iris for the garden.* Women's League, Ocean Avenue Congregational Church, Brooklyn.

By the Curator of Plants:

February 24. *Plants and human evolution.* Brooklyn Nature Club at the Children's Museum.

By the Curator of the Herbarium:

January 14. *Ferns of the New York area.* Joint meeting, Torrey Botanical Club and American Fern Society. Brooklyn Botanic Garden.

January 29. *Flora of the Cumberland Mountains.* Connecticut Botanical Society. Yale University.

February 28. *Flowering plants around New York.* School Nature League. American Museum of Natural History.

April 8. *Botanic Gardens of England and the Continent.* Department of Botany of the Brooklyn Institute of Arts and Sciences. Academy of Music, Brooklyn.

December 29. *Midsummer plants of Tennessee.* Section on Taxonomy, American Association for the Advancement of Science. Richmond, Virginia.

By the Horticulturist:

January 19. *Plant propagation.* Horticultural Society of New York.

January 24. *House plant clinic.* City Gardens Club. New York City.

February 8. *Gardening.* Westhampton Garden Club. New York City.

February 9. *Beautiful gardens.* Young Men's Christian Association. Brooklyn.

February 16. *English and American gardening.* Women's Club Gardeners of Greenwich, Conn.

March 22. *House plant clinic.* Garden Club of Princeton (N. J.).

March 29–31. *The Romance of plant life.* Federated Garden Clubs of Connecticut, Inc. (March 29 at Stamford; March 30 at New Haven; March 31 at Hartford for the Connecticut Horticultural Society).

April 4. *The Romance of plant life.* Century Club, Scranton, Pa.

April 27. *The Romance of plant life.* Brooklyn (N. Y.) Union Gas Company.

April 28. *The Romance of plant life.* English Speaking Union. New York Branch.

May 11. *Plant propagation.* Poughkeepsie (N. Y.) Garden Club.

May 16. *City gardens.* Hill Association, Garden Section. Brooklyn.

May 18. *Less familiar trees and shrubs.* Garden Club of Darien (Conn.).

June 9. *Plant propagation.* Shore Garden Club of New Jersey, Deal, N. J.

July 18. *The Romance of plant life.* Garden Club of Lawrence (L. I.).

August 2. *English gardens.* Bellport (L. I.) Garden Club.

August 6. *Rock gardens.* American Rock Garden Society, Southern Region. Blue Ridge, S. C.

September 28. *Fall work for spring effects.* Staten Island Garden Club.

By the Field Secretary:

January 3. *The Brooklyn Botanic Garden.* Garden Club of Lynbrook, Lynbrook, L. I.

April 12. *Activities of the Brooklyn Botanic Garden.* Kings County Medical Association, Brooklyn.

April 18. *The Brooklyn Botanic Garden.* Colony House Mothers Club, Brooklyn.

April 26. *Activities of the Brooklyn Botanic Garden.* Woman's Science League, Grace Episcopal Church, Jamaica, L. I.

April 27. *Development of Brooklyn Botanic Garden.* Brooklyn Borough Gas Company.

May 4. *The Brooklyn Botanic Garden.* Y. W. C. A. Young Married Women's Club, Brooklyn.

May 8. *The Brooklyn Botanic Garden.* Unitarian Church Society, Brooklyn.

May 12. *The Brooklyn Botanic Garden.* Mothers' Club P. T. A., Bellmore, L. I.

May 12. *The Brooklyn Botanic Garden.* Faculty Wives of Polytechnic Institute. At the Garden.

May 18. *The Brooklyn Botanic Garden.* Westminister Society of Flatbush Presbyterian Church. At the Garden.

May 19. *The Brooklyn Botanic Garden.* Library Association. At the Garden.

By the Librarian:

April 11. *The Library's periodicals and its binding needs.* Library tea given by the Library Committee of the Woman's Auxiliary. At the Garden.

By the Assistant Curator of Elementary Instruction:

July 20. *Summer-blooming bulbs.* Shelter Island Garden Club, Shelter Island, N. Y.

By Instructors:

Miss Carroll:

May 11. *Educational exhibit of the Department of Elementary Instruction.* Brooklyn Assistants to Principal. At the Garden.

Miss Hammond:

October 16. *Dividends from nature.* Junior League, Grace Aguilar Number 20, United Order True Sisters.

By Research Assistants:

Dr. Marcy:

April 13. *Inheritance of disease resistance in sorghum.* Society of Biology and Medicine, Brooklyn College.

Dr. Utter:

May 18. *Culture and inoculation studies on races of the loose and covered smuts of oats.* Torrey Botanical Club. At New York Botanical Garden.

June 24. *The iris thrips and their control.* Long Island Horticultural Society. At State Institute of Applied Agriculture, Farmingdale, N. Y.

December 29. (With Dr. Floyd F. Smith.) *Studies on the control of the iris thrips.* American Association of Economic Entomologists, Richmond, Va.

By the Resident Investigator (Economic Plants):

February 14. *Variation in Behavior Induced by Caffeine.* New York Academy of Sciences (Section of Biology). American Museum of Natural History, New York City.

April 12. *Recent Advances in Plant Physiology.* Anaphy (Honorary Biology Society) Alumni Association, Long Island University, Brooklyn, New York.

August 30. *Micro-structural Changes in Muscle Fibers After Caffeine.* General Science Meeting at the Marine Biological Laboratory, Woods Hole, Massachusetts.

October 21. *Color Photography of Plants and Animals at the Marine Biological Laboratory.* Biology Honor Society (Anaphy), Long Island University.

November 18. *A Biologist's View of Nazi Terrorism.* General Meeting, Long Island University.

November 28. *Botanical Courses in the Pre-medical Curriculum.* Lancet (Pre-medical Honor Society) Induction Meeting, Long Island University.

By the Resident Investigator (Ferns):

May 20. *Numerous aspects of plant conservation.* Wild Flower trip to Indian Point (New York).

By the Foreman Gardener (George R. Bishop):

January 3. *House plants.* Maplewood (N. J.) Garden Club.
April 4. *Annuals.* Brooklyn (N. Y.) Edison Company.

By the Gardener in Charge of the Rose Garden (S. R. Tilley):

April 5. *Rose lore.* Green Harbors Garden Club, Massapequa, L. I.

APPENDIX 4

RADIO TALKS BY THE BOTANIC GARDEN PERSONNEL DURING 1938

By the Director:

From Station WMBG (Richmond):

December 29. Press interview on Botanical Society of America annual meeting.

By the Curator of Public Instruction:

From Station WNYC:

January 7. New developments in plant science.
February 18. Interesting plants at the Brooklyn Botanic Garden.
April 29. Spring flowers at the Brooklyn Botanic Garden.
May 27. What to see now at the Brooklyn Botanic Garden.
December 29. New developments in plant science during 1938.

From Station WBBC:

November 3. The Brooklyn Botanic Garden.

By the Curator of Elementary Instruction:

From Station WNYC:

April 1. Children's gardens.

From Station WMBG (Richmond, Va.):

December 29. Gardens for children.

By the Curator of the Herbarium:

From Station WNYC:

November 17. Plant Names.

By the Horticulturist:

From Station WOR:

January 25. Parlor plants at home.
February 11. Introduction to Clematis.
June 17. Rampant roses.
August 5. Tudor knot gardens.
October 10. Planting roses.

From Station WNYC:

January 21. Foliage plants in the home.
May 13. Planting annuals.
November 3. Story of the chrysanthemum.

From Station WMCA:

March 15. The International Flower Show.

By Instructors:

(Miss Carroll)
From Station WWNC (Asheville, N. C.):

August 25. Plant life seen through art.

(Miss Miner)
From Station WNYC:

December 1. House plants easy to grow.

By the Assistant in Woody Plants:

From Station WNYC:

March 4. Plant explorers I.
March 18. Plant explorers II.
April 15. Plant evergreens now.
June 10. Lilacs.
December 15. Evergreen shrubs for city gardens.

From Station WOR:

February 22. The home landscape: Boundary plantings.
April 26. Garden favorites: Magnolias.
July 1. Garden favorites: Spireas.
November 28. Familiar evergreens: Pines.
December 9. Adventuring with plant hunters.

APPENDIX 5

FIELD TRIPS CONDUCTED, 1938

By the Curator of Public Instruction:

September 10. Torrey Botanical Club. Hollis, Queens.

June 4. New York Biology Teachers Association. Belmont Lake State Park. Long Island, N. Y.

By the Assistant in Woody Plants:

May 22. Torrey Botanical Club. Ornamental Shrubs. Brooklyn Botanic Garden.

October 15. Torrey Botanical Club. Species of Pine. Brooklyn Botanic Garden.

By the Resident Investigator (Ferns):

May 20. Wild Flower Trip to Indian Point (New York).

By the Custodian:

May 28. Sussex County, N. J., Nature Club. Herons Nest, Layton, N. J., to observe thousands of *Cypripedium acaule* in a single stand.

June 2. Garden Teachers Association. Brooklyn Botanic Garden.

APPENDIX 6

ORGANIZATIONS MEETING AT THE GARDEN, 1938

January 14. Torrey Botanical Club and American Fern Society.

January 28. Woman's Auxiliary, Mrs. Constance Spry.

February 2. Department of Botany, Brooklyn Institute of Arts and Sciences.

February 16. Biology Conference, Brooklyn College.

February 17. Westbury Horticultural Society.

February 26. School Art League.

March 26. Program Planning Committee of Biology Association.

April 11. Library Committee, Woman's Auxiliary of Brooklyn Botanic Garden.

April 12. Woman's Auxiliary, Kings County Medical Association.

April 22. Fortnightly Library Club.

May 1. Reconciliation Trips, Inc.
May 2. Mothers' Club, Kings Highway Church.
May 4. '76 Chapter D. A. R.
May 11. Flatbush Chamber of Commerce.
May 11. Brooklyn Assistants to Principals.
May 12. Wives of Faculty, Polytechnic Institute.
May 12. American Nature Study Society.
May 14. School Art League.
May 16. Bay Ridge Garden Club.
May 16. Brooklyn Section P. S. Kindergarten Association.
May 16. Business Woman's League, Dutch Church of Flatbush.
May 17. City Garden Club.
May 18. Westminster Society, Flatbush Presbyterian Church.
May 19. Contemporary Club.
May 19. Brooklyn Library Association.
May 19. Assistants to Principals, Bor. of Queens.
May 19. Dutch Church Club.
May 25. Young Married Women's Club, Y. W. C. A.
June 21. Ridgefield Garden Club (N. J.).
July 6. Sheepshead Bay M. E. Church Mother's Club.
October 1. School Art League.
October 4. Torrey Botanical Club.
October 9. Reconciliation Trips, Inc.
October 11. Department of Botany, Brooklyn Institute.
October 17. Madison Garden Club (N. J.).
October 28. Reconciliation Trips, Inc.
November 15. Woman's Auxiliary, Brooklyn Botanic Garden.
November 17. Woman's Auxiliary, Brooklyn Botanic Garden.
November 19. Woman's Auxiliary (afternoon), Brooklyn Botanic Garden.
November 19. Woman's Auxiliary (evening), Brooklyn Botanic Garden.
November 29. Teachers of Brooklyn.
December 1. Woman's Auxiliary, Brooklyn Botanic Garden.
December 3. School Art League.

43 Organizations. Total attendance, 5831.

APPENDIX 7

REPORT OF PHOTOGRAPHIC WORK

Negatives on file December 31, 1937		9,582
Negatives accessioned during 1938		168
Total negatives on file December 31, 1938		9,750
Lantern slides on file December 31, 1937		6,728
Lantern slides accessioned during 1938		84
Total lantern slides on file December 31, 1938		6,812
Prints on file December 31, 1937		7,259
Prints made during 1938	688	
Used or distributed	508	
Prints filed during 1938		180
Total prints on file December 31, 1938		7,439
Enlargements made		37
Transparencies made		8
Motion pictures made (in technicolor)		2 reels

All photographic work is by Mr. Louis Buhle, staff photographer, and all halftone reproductions in Brooklyn Botanic Garden publications are from photographs by Mr. Buhle unless otherwise designated.

APPENDIX 8

REPORT ON BROOKLYN BOTANIC GARDEN PUBLICATIONS, 1938

Ecology

Official Organ of the Ecological Society of America. Quarterly. Volume XIX comprised 36 papers (besides reviews, proceedings, and miscellaneous matter), 607 pages and 119 text figures (as against 37 papers, 560 pages, and 118 text figures in 1937). The circulation at the close of the fiscal year (November 30, 1938) was 1,069 as against 1,041 one year ago.

The annual budget was $4,503.54, the credit balance $613.10, and assets over liabilities $125.93 (as against $4,381.10, $215.44, and $304.74 assets over liabilities in 1937), plus the value of back sets and volumes on hand. Dr. Henry K. Svenson continued on the editorial board as the Brooklyn Botanic Garden representative. Prof. Alfred E. Emerson and Prof. George D. Fuller, both of the University of Chicago, continued as Editors.

Genetics

In Cooperation with the Editorial Board of Genetics

Bimonthly. Volume XXIII comprised 37 papers, 656 pages, 7 plates and 181 text figures (as against 46 papers, 663 pages, 5 plates, and 84 text figures in 1937). At the close of the fiscal year (November 30, 1938) the circulation was 765, the annual budget $9,856.56, and the credit balance $3,091.68 (as against 770, $9,-830.02, and $4,118.35 in 1937), plus the value of back sets and volumes on hand. Dr. L. C. Dunn, of Columbia University, continued as Managing Editor.

Brooklyn Botanic Garden Record

Quarterly. Volume XXVII comprised 428 pages. The April number comprised the Annual Report. The circulation of the Record at the close of the year was 1,446.

Leaflets

One single number and one double number were issued. The circulation at the close of the year was 1,590.

Contributions and Memoirs

Numbers 80, 82, 83, 84, and 86 of the *Contributions* were published.

No *Memoir* was published.

APPENDIX 9

BY WAY OF WELCOME [1]

Nothing could afford me greater pleasure than to extend, on behalf of the Brooklyn Botanic Garden Governing Committee and Staff, a cordial welcome to an audience assembled for the purpose which brings us together this evening.

Soon after Jonathan Swift, the author of *Gulliver's Travels,* had graduated from Dublin University, in 1685, he entered the

[1] Address, by the Director, at the first of a series of three meetings in recognition of the twenty-fifth anniversary of the Department of Elementary Instruction, under the curatorship of Ellen Eddy Shaw, at the Brooklyn Botanic Garden, November 15, 1938.

family of Sir William Temple as his secretary. Sir William's interest in horticulture and the fame of his garden have become, in horticultural circles, almost legendary. As I have recently noted elsewhere, it was he who left instructions that when he died he should be buried by the side of his wife in Westminster Abbey, but, by his special instructions, his heart was buried, not beside his wife, but in a silver box under a sundial in his garden.

It was not strange that the future Dean of St. Patrick's, in Dublin, absorbed some of his patron's enthusiasm for gardening. Taking advantage of the first opportunity that offered, he made his sovereign, King William III, acquainted with the culinary virtues of asparagus. The King showed his appreciation of this by offering young Swift the command of a troop of horse. The honor was declined, but it remains as perhaps the most extravagant recognition ever offered in the realm of adult education.

But I believe the rewards of adult education are rarely as spontaneous, and rarely yield such solid satisfaction, as those afforded in juvenile education by the boys and girls themselves. Nothing, of course, can be more important for a community or a nation than the education of its youth, and so, when the educational program of the Brooklyn Botanic Garden was being elaborated, a little over twenty-five years ago, the underlying thought was that if the Garden was to render the greatest possible service to the community that supports it, educational opportunities should be provided for the children. In 1910 this was a new conception of the functions of a botanic garden. There were no precedents to follow. It was necessary to blaze a new trail.

Now a knowledge of the history of pedagogy, an understanding of psychology, a study of method in the teacher's college or normal school are important equipment for success in teaching; but the most important requirement for the greatest success is the personality of the teacher, and a natural endowment for the inspiration and leadership of boys and girls. This is particularly true when a new trail is to be blazed, and especially when, as here, the attendance is not compulsory but wholly voluntary. You cannot get a voluntary attendance of 50,000 children a year, as at the Botanic Garden each year, even to indulge a major enthusiasm, if the boys and girls "don't like the teacher."

But our Department of Elementary Instruction has to deal, not

only with children and adolescents, but with their teachers as well, and it was of the highest importance that the curator-in-charge should understand the teacher's problems, not merely from reading about them, but from first-hand experience in the schoolroom. Otherwise teachers would not come by hundreds, as they do each year to the Botanic Garden, to consult with the curator on ways and means of making their work more effective.

And so you can realize how vastly important was the choice of the first person to undertake this new thing in education, of developing at a botanic garden an educational program for children and their teachers.

What is this rare gift which the teacher's college can only supplement but cannot confer? Let me approach the statement of it by quoting from the *Religio Medici,* of Sir Thomas Browne. "I cannot go to cure the body of my patient," said he, "but I forget my profession, and call unto God for his soul."

Now, if you could look at the manuscript from which I am reading, you would see the dim but distinct outline of the portrait of her whose quarter century of service we are met to celebrate this evening. And I haven't the slightest doubt but that that portrait, and the name that goes with it, have been in the back of the mind of each one of you, as I have been speaking.

Sir Thomas Browne, attending a sick patient, forgot his profession in his solicitude for the man himself. So this gifted teacher, this rare personality whom we honor this evening, never, I firmly believe, stood before an audience (she not infrequently addresses an audience of 3000 boys) or a class, and never conferred with two or three boys or girls (or one, as often), without feeling and showing far more interest in the boys and girls themselves than in the subject of nature study with plants.

It was Rousseau, the author of that great educational classic, *Emile,* who said, "People do not understand childhood. With the false notions we have of it, the further we go the more we blunder."

It is sympathetic understanding of children, of adolescent boys and girls, combined with a rich educational experience before coming to us, that explains the outstanding success that has marked the work of Miss Shaw during the past twenty-five years. The

celebration of this accomplishment had only to be suggested and every one concerned was more than eager to have a part in it.

King William offered Dean Swift the command of a troop of horse for teaching him something about asparagus. He declined it because he would rather be a preacher and teacher. During the past twenty-five years Miss Shaw has taught more than a million boys and girls about roses and radishes, peas and petunias, sweet-corn and sweet-william. No king and no botanic garden director, has offered her the command of anything. But troops of eager boys and girls have come voluntarily to the Brooklyn Botanic Garden every Saturday, on vacation days, after school hours, during school hours, in season and out of season—many of them for five and six, and even seven, consecutive years. They have ultimately attained doctors' degrees in botany; they have become teachers about plant life in high schools and colleges; they have become successful florists and nurserymen.

They come back to see her after they have married and have families of their own. After they have become established in business they have contributed to the support of her work. To be drafted as their commander by such troops as this is a greater honor than any king can confer, and it cannot be declined.

One day when Malvina Hoffman was talking with the sculptor Mestrovic in his studio, she asked him, "How many out of your big class are given diplomas each year on graduation?"

"Oh," he replied, "quite a number receive the grade of capable craftsmen. These can carve in wood or stone for other sculptors, but if I can find two worthy of being called artists I am encouraged."

"What do you feel is the greatest lack in their make-up—what prevents many others of talent from measuring up to this standard?"

She quotes his reply in French: "It is the quality of love that is lacking, Malvina. You know that in America as well as we do here in Yugo-Slavia. They work with their hands but not with their souls."

Sir William Temple ordered his heart to be placed in his garden after his death, but the truly great teacher whom we delight to honor this evening has put her heart into this Garden for twenty-five consecutive years, and has won for herself a warm abiding place in the hearts of the young and the old in this community.

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RECORD. Established, January, 1912. An administrative periodical issued quarterly (1912–1928); bimonthly (1929–1932); quarterly (1933–). Contains, among other things, the *Annual Report* of the director and heads of departments, special reports, announcements of courses of instruction, seed list, guides, miscellaneous papers, and notes concerning Garden progress and events. Free to members of the Garden. To others $1.00 a year. Circulates in 59 countries.

MEMOIRS. Established, July, 1918. Published irregularly. Not offered in exchange. Circulates in 48 countries.

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Volume II. The vegetation of Long Island. Part I, The vegetation of Montauk: A study of grassland and forest. By Norman Taylor, June 11, 1923. 108 pages. $1.00, plus postage.

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BROOKLYN BOTANIC GARDEN RECORD

VOL. XXVIII JULY, 1939 NO. 3

THE ROSE GARDEN

OF THE

BROOKLYN BOTANIC GARDEN

GUIDE NO. 9

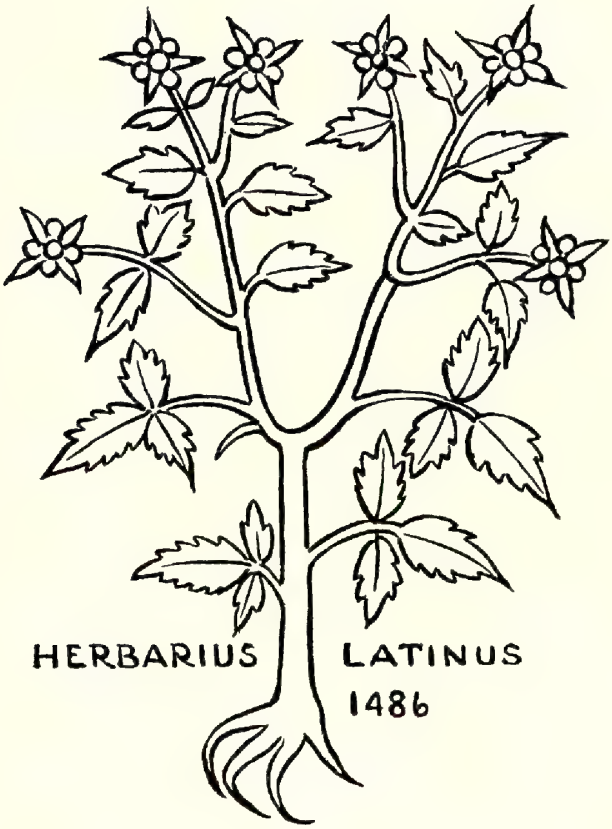

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FIG. 1. General view facing south—north pergola in the foreground. June 9. (9322)

BROOKLYN BOTANIC GARDEN RECORD

VOL. XXVIII JULY, 1939 NO. 3

THE ROSE GARDEN OF THE BROOKLYN BOTANIC GARDEN[1]

BY MONTAGUE FREE

This Rose Garden was made possible through the generosity of Mr. and Mrs. Walter V. Cranford, former residents of Brooklyn. The design was prepared by Mr. Harold A. Caparn, Consulting Landscape Architect of the Botanic Garden. Work on the necessary grading was started about the middle of June, 1927. In the fall, nearly one thousand rose plants were set out and in the following spring two thousand additional bushes were planted. The garden now contains more than three thousand roses in about six hundred and fifty species and varieties. Where shade conditions are such as to be unsuitable for the growth of roses, rhododendrons and plants of a similar nature are used.

PLAN OF THE GARDEN

The Rose Garden, 500 feet long and 93 feet wide, occupying an area of about one acre west of the Esplanade, is enclosed by a Doric pergola at the north end and by a wooden trellis supported on concrete posts on the other sides. Towards the south end of the garden a rectangular mound extending across almost the whole width of the garden provides a vantage point from which to view the garden as a whole. Surmounting this elevation is a lattice-work pavilion supported by concrete posts and wooden Doric columns, and two short pergolas connect the pavilion with the east and west entrance gates. North of the pavilion the garden forms a rectangle, 353 feet long and 93 feet

[1] GUIDE NO. 9. To follow this guide in the Rose Garden, one should begin at the northwest corner.

wide, and south of the pavilion the area is roughly in the shape of a right-angled triangle with a convex hypotenuse. The whole garden is bounded by a wide border containing wild roses with their horticultural derivatives not included in the central beds. These, with the rose-covered fence behind, serve as a frame or setting for the rest of the garden, and give a definiteness and dignity to the composition that is often lacking in the ordinary collection of bedding roses. It is not easy to assemble quickly a collection of wild roses, and our exhibit of species is still far from complete, but we are constantly adding new ones and it is hoped that in the near future we shall have a large representation of roses of this type.

Next to the boundary border comes a walk which extends around the whole garden. Inside the walk the triangular area south of the pavilion contains three beds of irregular shape set in turf. The southernmost bed contains Sweetbrier roses and the hybrids known as the Penzance briers developed by Lord Penzance from the Common Sweetbrier, *Rosa Eglanteria* (*R. rubiginosa*). The bed on the east is occupied by roses of historical interest such as the Provence, Musk, Damask roses, etc. The bed on the west is temporarily occupied by the variety Mary Wallace, the scrambling growths of which are arched and tied down.

North of the pavilion, the central grass panel is occupied by three rows of five beds, each ten feet wide and about fifty feet long. The center row of beds contains Hybrid Perpetual roses with a border of Polyantha roses. The side beds contain Noisette, Tea, Bourbon, China, Hybrid Tea, and Pernetiana roses with the major portion of the area given over to the popular Hybrid Teas.

The walks are spanned by ten double arches of metal which support climbing and rambler roses. A row of ornamental concrete posts, thirty in all, connected by chains, extends down the center of the beds on two sides of the central panel. These are for the support of rose festoons. Cedar posts for pillar roses are placed at intervals along the boundary border. On the terrace slopes around the pavilion, roses of the varieties Max Graf and

Wichuraiana are grown as ground covers. The bank north of the pergola is planted with rambling and climbing roses in several varieties, which are allowed to grow at will and completely cover it.

On the summit of the bank is "The Overlook"—a structure furnished with a row of seats from which one may obtain the most effective view of the Rose Garden as a whole. "The Overlook" is a continuation of the Rose Garden design to a terminus at the summit of the Museum embankment.

The Rose Garden was extended in the fall of 1935 by the construction of the "Rose Arc." This was a gift from Mrs. Cranford as a Memorial to her late husband. The area, as its name implies, is roughly semicircular in form bounded on the curved side by a series of arches furnished with rambler roses. The curved embankment back of the arches is covered with the Memorial Rose (*Rosa Wichuraiana*). In front of the arches are three beds containing more than six hundred Hybrid Tea roses. Surrounding the pool, which is the central feature, is a wide planting of the rose Clytemnestra.

In planning the Garden, educational aspects were kept in the foreground. It is obvious from the preceding paragraphs that roses of practically every type hardy in this climate are grown, and that they are displayed in all the forms common in horticultural practice. The various structures of the Rose Garden—fences, pergolas, arches, pavilion, etc.—were designed for the display of climbing roses in as many ways as practicable. If fewer types and fewer varieties of roses had been planted, selecting only those kinds that do well here, the general appearance of the garden might have been improved. It was felt, however, that any sacrifice of beauty occasioned by the present arrangement would be more than compensated by its educational value.

In preparing for planting, the whole area of the garden was worked over and eighteen inches of good topsoil provided. This was accomplished by using the topsoil from the walk that extends all around the garden to supplement that of the beds, and removing subsoil from the beds to fill in the walk. One hundred and fifty cubic yards of cow manure were mixed with the topsoil.

Rose Species

The genus *Rosa* gives its name to the Family Rosaceae, an extensive aggregation of trees, shrubs, and herbaceous plants containing such well-known subjects as Apple, Pear, Peach, Cherry, Spiraea, Cotoneaster, Kerria, Strawberry, Geum, and Potentilla. Usually the flowers have five (rarely four to nine) sepals and petals. A few species of *Rosa* have only four petals; two of these, *R. omeiensis* and *R. sericea*, are represented in this garden.

The Rose is found wild only in the Northern Hemisphere, being most abundant in the north temperate regions. It is extremely widespread, ranging from Greenland and Kamchatka, to Mexico, India, Northern Africa, and the Philippine Islands. Botanists are far from agreeing on the number of species represented in the genus *Rosa*. Bentham and Hooker recognized only about thirty species, while Gandoger, a French botanist, described over four thousand species coming from Europe and Western Asia alone. Conservative opinions are that the species number between one and two hundred. It has been estimated that there are around sixteen thousand named varieties of roses.

Garden roses are, of course, derived originally from some of the wild kinds and it is thus appropriate first to call attention to the more important and interesting of the rose species which are displayed in the wide border that surrounds the garden.

Many of these wild roses are of considerable value in garden decoration, either as isolated specimens on the border of the lawn, in the shrubbery, or in naturalistic plantings. In the fall many of them provide a display of attractive fruits (called "hips" or "heps"), in addition to abundance of blossoms in late spring or early summer. Then, too, there are some species with attractive foliage, and some with large, conspicuous, colored spines.

Entering the garden from the north and proceeding down the west walk, we will first notice *Rosa virginiana* (*R. lucida*) native from Newfoundland to Virginia, extending west to Missouri. This has bright pink, rather large flowers. The foliage is good, tinted with red in the fall, and provides an excellent background for its red fruits. It may form a compact bush five feet high but with us it is more lowly and does not get above three feet.

It has the unpleasant habit of throwing up suckers several feet from the parent bush, and, as these invariably come up where they are not wanted, it rather spoils its value for planting with more sedate and civilized bushes. However, it is good for wild garden planting, more especially as it will grow in poor, dry soil. It is of interest in being the first American rose to be cultivated in Europe.

Next comes *Rosa rubrifolia* which, as may be gathered from the specific name, has reddish leaves. Indeed, were it not for its colored foliage, covered with "bloom" like that on some plums, it would not be worth growing, for its flowers do not amount to much. The trailing rose Max Graf growing on the terrace bank north of the pavilion is grafted, or budded, on the roots of this species. With a perversity which almost drives the gardener to distraction, the specimens of *R. rubrifolia* growing in their rightful place do not possess anything like the vigor shown by those on the terrace whose suckers we are continually removing lest they smother their foster children.

Passing by a number of moss rose varieties, which will receive attention later, we come to *Rosa setigera*, planted near the first arch. This is the **Prairie Rose,** sometimes appropriately called the Bramble-leaved Rose, for its leaves, with three leaflets, produced on arching canes, do remind one of those of the blackberry or dewberry. It is a vigorous grower and a glorious sight when its blossoms of clear deep pink are displayed in arching sprays of loveliness. It is the latest of the wild roses to bloom and valuable on this account also. Although sometimes recommended for training as a climbing or pillar rose, most folks who know it well admit that it displays its beauty to best advantage when grown as a bush, but only when planted so that it has plenty of room to do itself justice. Nearby, trained on a pillar, is one of its children, Baltimore Belle, introduced nearly a hundred years ago by Feast and Sons, Baltimore, Maryland. Anna Maria and Beauty of the Prairies, both *setigera* hybrids, were introduced by the same firm about the same time. These descendants of the Prairie roses are not much grown today except in regions having severe climates where their hardiness to cold makes them valuable. However, Baltimore Belle according to Captain Thomas

FIG. 2. General view of north rectangle facing north-west. (8714)

is "supposed to have Noisette blood and not absolutely hardy." It survived the winter of 1933–34, the severest on record here, without injury.

Just before reaching the second arch, there is a selection of **Lambertiana roses**—garden forms belonging to the *multiflora* strain. These were originated by Peter Lambert, of Trier, Germany, and are, in general, scrambling shrubs, some of which may be trained as pillar roses. They are supposed to be recurrent bloomers but their performance in the Brooklyn Botanic Garden has not been such as to warrant one going into ecstasies over them. Judged on the basis of their behavior here, the best varieties in this group are: Geheimrat Dr. Mittweg, Heinrich Conrad Soth, and Peter Rosegger. Associated with the Lambertiana roses, we have the Blackberry Rose (*R. multiflora*), native to Japan and Korea, interesting because forms of it are in wide use as an understock for Hybrid Tea roses. It is extremely vigorous, growing eight feet tall with panicles of small white flowers which give rise to quantities of fruits resembling red currants, but smaller. The Cathay Rose, *R. cathayensis* (*R. multiflora var. cathayensis*), is of more slender habit and better adapted for training as a climber. Specimens may be seen on the arch and nearby pillar. This variety has small bright pink flowers. See also under Climbers and Polyantha roses.

Next to the Lambertiana group are two good specimens of *Rosa Hugonis*, a species which, partly because of extensive advertising, is now a well-known and widely planted rose. It is one of the first roses to come into bloom, and has a pleasing habit of growth and fine foliage; when covered with its myriads of light yellow flowers it presents a handsome appearance. Complaints are sometimes made that it flowers itself to death and it has been suggested that a way to avoid this is to cut out a few of the canes when blossoming is over so as to reduce the number of fruits formed and thus lessen the strain on the plant.

Adjoining are three bushes of a *Hugonis* hybrid raised by Dr. Van Fleet and named Dr. E. M. Mills in honor of a former President of The American Rose Society. Its male parentage is uncertain. It forms a bushy shrub, about four feet high, blossoming early in the season with small, semi-double, primrose yellow flowers.

In this general neighborhood are several plants of *Rosa foetida* (*R. lutea*). This species is of great interest, because one of its varieties (Persian Yellow, 1837) was, by Monsieur Pernet-Ducher, crossed with a Hybrid Perpetual (Antoine Ducher) which resulted in the famous Soleil d'Or which, by further hybridization, gave rise to the Pernetiana strain of Hybrid Tea roses (see p. 194). Austrian Copper (1596) and Harison's Yellow (1830), also varieties of *R. foetida*, are nearby. Austrian Copper and Persian Yellow, so far, have resolutely refused to thrive with us although Soleil d'Or, which has a sinister reputation as a "doer" is surprisingly healthy. An English writer says Austrian Briers "will not survive urban conditions" which may account for their failure here. Two *R. foetida* hybrids, vigorous enough to be trained as pillar or trellis roses, are Le Rêve and Star of Persia. These varieties grow well here and may be seen on the arch and pillars nearest to their parent.

Starting at the third arch and continuing to the pavilion pergola is a collection of varieties and hybrids of *Rosa rugosa*. There are so many derivatives of this species that a similar area on the opposite side of the garden is necessary to accommodate them.

Rosa rugosa is a sturdy, upright bush, with thorny stems and handsome, wrinkled foliage. The flowers are single, large, quite fragrant, tending towards magenta in color. The large, orange-red fruits are ornamental in the fall. This rose is noted for its hardiness and ability to thrive under city conditions and on the sea shore where subject to salt spray.

Some of its outstanding hybrids and varieties are as follows:

R. rugosa repens alba, a trailing form with single, white flowers, and extremely vigorous, serpentine growth.

Max Graf is also a trailing kind, which provides a stunning exhibition of single pink flowers in June. This variety may be seen effectively displayed on the terrace bank on the north side of the Pavilion.

Conrad Ferdinand Meyer, the most vigorous of all the *rugosa* hybrids, has large double flowers of light pink and is a glorious sight when in bloom. It is not a plant for the small garden because it is capable of growing fifteen feet high and as much through. This variety shows close affinity to the Hybrid Per-

petuals, and has fewer of the *rugosa* characteristics of wrinkled foliage, tendency to sucker, and abundant prickles, than most of the *rugosa* hybrids.

On the opposite side of the garden Hildenbrandseck, also a vigorous grower, produces its semi-double, carmine flowers over a long season. Next to this variety is Agnes the "yellow rugosa." Although awarded a Gold Medal "for the most distinct Rose of a new type originated in America" its performance with us has been disappointing. It has the merit of being hardy.

A few yards to the north is F. J. Grootendorst, an "everblooming" variety whose flowers, which are produced in clusters, are described as bright red. It is a vigorous grower and can be used as a specimen or as a hedge by those to whom its color is not distressing. A sport from this variety is Pink Grootendorst with somewhat larger flowers of a more pleasing color.

Other noteworthy roses in the *rugosa* group are Ruskin, Rose à Parfum de l'Hay, Türke's Rugosa Sämling, and Blanc Double de Coubert.

Proceeding southward along the west walk, we come to the roughly triangular area south of the pavilion.

In the border adjacent to the southwest pergola are several plants of *Rosa Rouletti*, a variety which, a few years ago, created somewhat of a furor in rock gardening circles because of its diminutive size and suitability for rock garden planting. It is almost the smallest rose in point of stature (Peon, known in this country as Tom Thumb, is still smaller) and is remarkable for its precocity in blooming—the smallest rooted cuttings being capable of producing flowers. It was introduced to general cultivation by M. Henri Correvon. He became acquainted with it through a friend, Dr. Roulet, who found it grown as a pot plant in the windows of cottages in the village of Mauborget, Switzerland. According to Correvon, who describes the circumstances attendant on its discovery and speculates on its origin,[1] the peasants say, "It has been grown here for centuries, but only in windows and never out in the garden, as it is so delicate a plant." Correvon wonders if de Candolle, the famous botanist who had

[1] The Gardeners' Chronicle. London. No. 1876, Vol. LXXII. Third Series. December 9, 1922.

his garden in Champagne not far from Mauborget, grew this rose and thus provided a source for its distribution in the neighborhood. It is probable that it is a selected form of *Rosa chinensis* var. *minima*, The Fairy Rose, or, as it is sometimes called, The Lawrance Rose. Correvon describes his plants of *Rosa Rouletti* as being five centimeters (two inches) high, but doubtless this extreme dwarfness may be attributed in part to pot culture, for the same plants doubled their stature when set in a bed out-of-doors. *Rosa Rouletti* seems to be as hardy as the general run of China roses. We have found that covering the plants in the fall with gravel is a great aid in carrying them successfully through the winter.

Towards the end of the border is a species from North West China—*Rosa bella*. It has carmine pink flowers on a bush capable of reaching eight feet, although our specimens have not yet surprised us with such vigor.

Turning the corner, we are confronted with a group of several plants of *Rosa pisocarpa*, a native species from the Pacific North West. It is an upright grower, with slender stems, many suckers, and few prickles.

A little to the north is a large group of the **Burnet Rose** or **Scotch Rose,** *Rosa spinosissima* and varieties. The garden forms of this rose, first produced by Robert Brown, of Perth, by crossing *R. spinosissima* with double-flowered garden roses, were at one time very popular in England. Paul, in his "The Rose Garden" (1848), lists seventy-six varieties. Varieties of the Scotch Rose, with the exception of var. *altaica*, var. *fulgens*, and Stanwell Perpetual are nowadays scarce and not easily obtained.

Passing by the elm tree with rhododendrons planted in its shade, we come to *Rosa californica*, a strong-growing shrub native from Oregon to lower California, and *Rosa villosa* (*pomifera*), a Eurasian species noteworthy for its large fruits.

Just south of the pavilion is a group of *Rosa canina* and several of its varieties. This is England's famous Dog Rose which grows so plentifully in the hedgerows there and perfumes the air with its sweet fragrance. In England, this species is largely used as an understock for Hybrid Tea roses. Its long, stout canes are admirable understocks for the production of "half-standard" and

"standard" or "tree" roses. Years ago (and maybe even now) men used to search the hedgerows for dog roses of suitable size and shape which were dug up, tied in bundles, and sold to nurserymen who budded garden roses on them. *Rosa canina* is a polymorphic species and some of its forms have been accorded subspecific rank by some botanists.

The Memorial Rose (*Rosa Wichuraiana*) covers part of the terrace bank on this side of the Pavilion. It is admirably adapted to this purpose, or, for that matter, as a ground cover anywhere, sloping or level, so long as dense shade is avoided. Neither flowers nor fruits are strikingly handsome—its chief value is for the carpet of shining, persistent foliage produced on its long trailing growths. We used to have one plant of this species trained on the trellis surrounding the garden as a reminder that it is an ancestor of many of the best of our modern climbers, but it is not a climber and is so much happier when allowed to ramble along the ground in its natural habit of growth that it was removed from the trellis.

It is convenient at this point to turn our attention to the beds in the central portion of this area.

Historical Roses

The north east bed is occupied by roses of historical or utilitarian interest.

Rosa gallica, the French Rose, is probably one of those referred to by Pliny, in his "Natural History," when he mentions the roses of Miletus. Some rosarians have suggested that the red *R. gallica* was the rose used as the emblem of the House of Lancaster during the "Wars of the Roses" in England, in the 15th century. Others assign this honor to *R. damascena*.

Rosa centifolia, the Hundred-leaved (petalled) Rose, Cabbage Rose, or Provence Rose, first mentioned by Herodotus, has been cultivated in Europe for more than two thousand years. One would think that a rose that had proved itself to be amenable to cultivation for so long a period would be tractable even in Brooklyn. For a while, however, we were unable to grow a respectable plant of this species. This failure possibly was due to its dislike of urban surroundings, or, more likely, because the

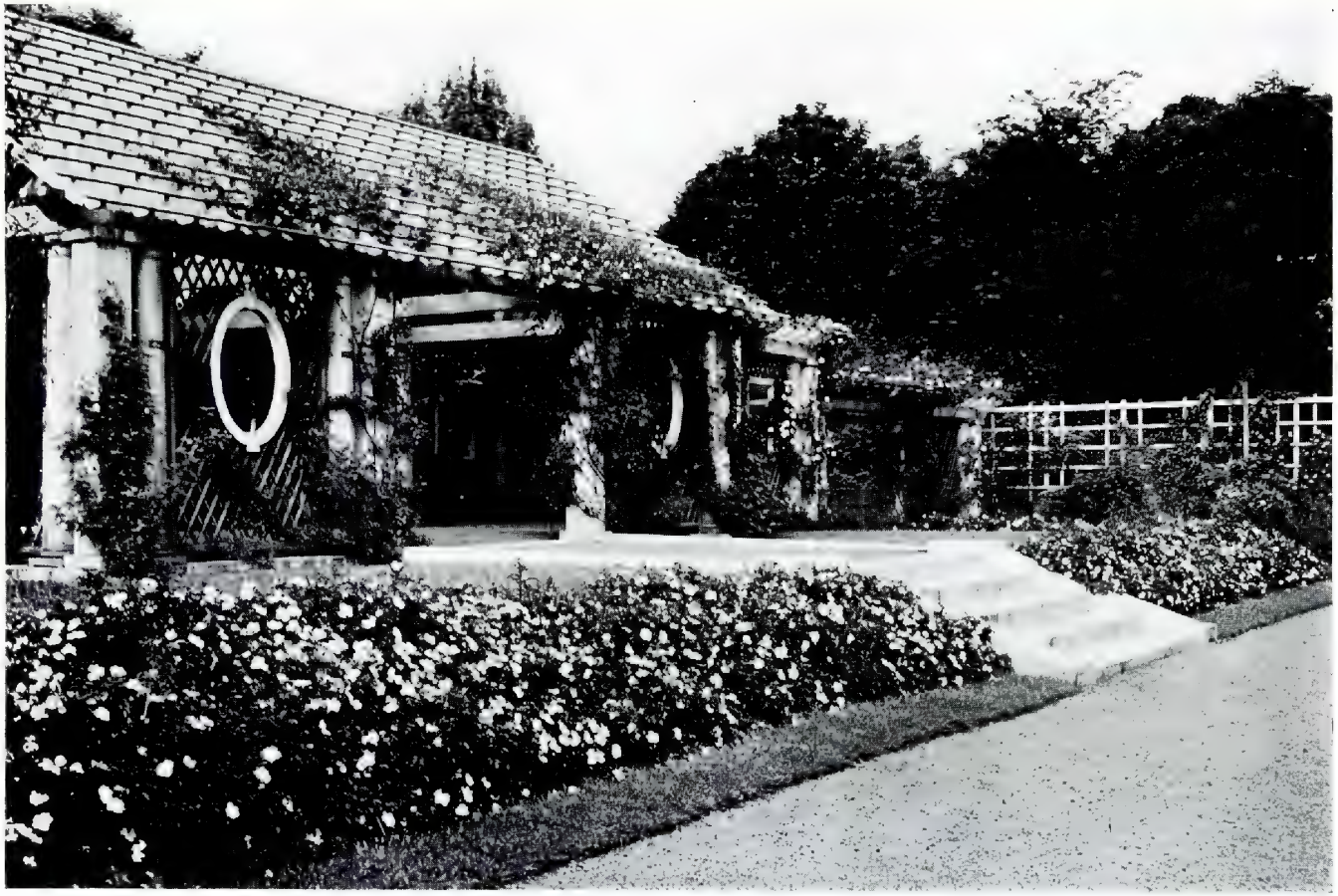

FIG. 3. Pavilion and Terrace. Rose Max Graf on banks. June. (6961)

plants were budded on uncongenial understocks. In the spring of 1933, plants on their own roots were set out in the hope that they would do better and they have done so. Theophrastus refers to this species in his *Enquiry into Plants*, VI. vi, 3–5: "Among roses there are many differences, in the number of petals, in roughness, in beauty of colour and in sweetness of scent. Most have five petals, but some have twelve or twenty, and some a great many more than these; for there are some, they say, which are even called 'hundred petalled.' Most of such roses grow near Philippi; for the people of that place get them on Mount Pangaeus where they are abundant and plant them." [1]

Considerable confusion exists regarding the nomenclature of these old roses. Ellen Willmott, in *The Genus Rosa*, says, "The Provins Rose is generally regarded as a variety of *Rosa centifolia* L. and the Provence Rose of *Rosa gallica* L." Parsons, however, and Nicolas, say that the Provins Rose is *Rosa gallica*, and in Rehder's *Manual of Cultivated Trees and Shrubs* and in *Standardized Plant Names* the Provence Rose is referred to *R. centifolia*.

The town of Provins in France is (or was) famous for its Conserve of Roses. Presumably, this is made from one or the other of the roses just mentioned—probably *Rosa gallica* var.

The Damask Rose, *Rosa damascena*, is supposed to be one of the species that helped Paestum achieve its fame for the beauty of its roses in the time of the Roman Emperors. The colors of both York and Lancaster are combined in the rose of that name which, in the terminology of the botanists, is *Rosa damascena* var. *versicolor*. Our group of "York and Lancaster" was received with the assurance that it was the true variety, but it fits the description of a parti-colored form (*Rosa gallica* var. *versicolor*) of the French Rose. This rose, whose flowers are striped red and white, is sometimes called Fair Rosamond's Rose, and is usually listed in catalogs as Rosa-Mundi. The name York and Lancaster is often misapplied to this variety. The true (we hope!) York and Lancaster will be planted in our garden this fall (1939).

"Attar of Roses" is obtained from the Damask Rose—largely

[1] Theophrastus. Enquiry into Plants. Eng. Trans. by Sir Arthur Hoyt. Vol. 2: 39.

from *R. damascena* var. *tringintapetala*. It is also made from *R. centifolia*, *R. moschata*, and a variety of *R. alba*. It may be interesting to record that, twenty-five or thirty years ago, *Rosa damascena* was raised at the Royal Botanic Gardens, Kew, from a hip received from a bush growing on the grave of the Persian poet, Omar Khayyám. A shoot from this plant was afterwards planted on the grave of Edward Fitzgerald, Omar Khayyám's first English translator.

Rosa alba was described by Pliny and cultivated by the Romans (J. Gérôme). Some authorities think that this species was the white rose used as an emblem by the House of York, but others incline to *Rosa arvensis*, a trailing species quite common in the British Isles. Maiden's Blush, an old variety of *R. alba*, is planted near the type.

The Musk Rose (*Rosa moschata*) ranges widely from southeastern Europe, northern Africa to Afghanistan and Nepal. It has long been known to cultivation and is supposed to be one of the roses known to Theophrastus. Gérôme says of this rose, "*Cultivé industriellement dans diverses regions d'Europe pour la production de l'essence de roses.*"

The North West Bed

The north west bed was originally intended to accommodate Boursault roses—derivatives of a cross between the Pyrenees Rose, *Rosa pendulina* (*R. alpina*), and *Rosa chinensis*. **Boursault roses,** with the exception of *R. Lheriteriana* (planted in west species border), are apparently unobtainable from American nurserymen, and, as two separate shipments of *R. pendulina* turned out to be the climbing rose Mary Wallace, it was decided to allow this variety to remain! Its long, arching shoots are bent over and fastened to stakes so that in June the whole bed is one mass of bright pink flowers.

Hybrid Sweetbriers

The southernmost bed contains the Sweetbrier Rose, or Eglantine, *Rosa Eglanteria* (*R. rubiginosa*), Austrian Copper, and a collection of Penzance Briers raised by Lord Penzance by hybridizing the Sweetbrier with Austrian Copper and with garden

FIG. 4. Bed of Pemberton roses at foot of north pergola. (8713)

roses. The striking feature about the Sweetbrier (and some of its hybrids) is the fragrance of the foliage, which, after a shower, or on a calm, moist day, is emitted so freely as to pervade the immediate neighborhood. As children, we used to gather a few leaves of this rose and roll them in our handkerchiefs—a cheap source of perfumery!

Some of the Penzance Briers, such as Anne of Geierstein, Catherine Seyton, and Rose Bradwardine, are extremely rampant and not suited for the small garden. Lady Penzance (*R. Eglanteria* × Jaune bicolore), a variety with copper colored flowers and shiny foliage, and Lord Penzance, with flowers of fawn shaded with salmon, are of moderate growth, not more than four or five feet high. Both varieties have fragrant foliage.

Continuing northward along the east walk, we pass *rugosa* roses and their varieties until just past the second arch we come to the next rose of considerable interest in *R. omeiensis* from Western China. This has white, *four-petalled* flowers, and handsome, finely divided, almost fern-like foliage. The stems are plentifully provided with flattened prickles. In the variety *pteracantha* the prickles are extraordinarily conspicuous, being broad and winglike at the base, and, when young, red and translucent. This species is well worth growing for its attractive foliage, and the variety for its unique spines.

A few yards further along is *Rosa Moyesii*, a Chinese species introduced by E. H. Wilson. Capable of producing gorgeous, single, blood-red flowers two and a half inches in diameter, it is exasperatingly cantankerous in its manner of growth. It is difficult to establish and seems to be incurably gawky. It has interesting urceolate fruits.

We now come to the main bulk of the **Moss roses** of which we have over fifty named varieties. The Moss roses probably first originated as a mutation of *Rosa centifolia*. The group name is applied to them because of the moss-like proliferations that fringe and cover the sepals and pedicels. Were it not for the sentimental interest attached to them because they were favorites of our grandmothers and great-grandmothers, they would most likely disappear entirely from our gardens. They are prone to mildew, and are dull and frowsy after flowering.

Aphids find congenial apartments among the "moss" of the buds where it is difficult to reach them with insecticides.

According to William Paul, moss roses were first introduced to England from Holland in 1596. Most of our specimens are still small and even those that have been in place for several years have not shown excessive vigor. Paul says: "Moss roses require high cultivation; some are of delicate growth, and will only flourish in a kindly soil; others are very hardy, but all, whether hardy or delicate, delight in a rich soil." This we do not have.

Continuing along the East walk, we pass more specimens of the **Damask Rose, French Rose,** and species of no special importance until at the end of the border we come upon the **Cinnamon Rose** (*Rosa cinnamomea*), a Eurasian species, the double form of which is sometimes found escaped from cultivation in the Eastern States. According to J. Gérôme, "This very ancient variety Rosier du Sainte-Sacrement was formerly much cultivated, because of its time of flowering coinciding generally with the date of the Fête-Dieu." [1] (Feast of Corpus Christi—the eighth Thursday after Easter.)

Pemberton Roses

The bed extending across the North end of the Garden is devoted to *Rosa moschata* and its hybrids originated in England about (1913 to 1919) by the Rev. Joseph H. Pemberton. These hybrids have received the general designation "Pemberton" roses. The simplicity of the names attached to them is alone sufficient to endear them to us. It is refreshing to come across such names as Ceres, Daphne, Galatea, Penelope, Sammy, and Thisbe; especially after one has been driven to frenzy by such names as Baronesse M. van Tuyll van Serooskerken, Souvenir de l'Aviateur Olivier de Montalent, General-Superior Arnold Janssen, Mrs. Erskine Pembroke Thom, and Mme. Grégoire Staechelin. The latter name seems to be in transition (in this country) to The Spanish Beauty; this is unfortunate in that we may have two names to contend with in place of one.

[1] "Plantes Ornementales" par J. Gérôme, Museum d'Histoire Naturelle, Paris, 1924.

The Pemberton roses in general are scrambling shrubs which may be grown either as bushes or trained on pillars. Most of them are vigorous and need plenty of room for their best development, as they are not adapted to stand severe pruning. They are seldom entirely out of bloom between June and frost. Their flowers range from white and yellow to carmine, and they usually provide a display of ornamental hips in the fall if the flower clusters are not pruned away. One of the best varieties is Prosperity which is smothered in white rosettes in June, with scattered blooming periods until frost. It makes an admirable pillar rose six feet high. Sammy, Moonlight, Daybreak, and Clytemnestra are other good varieties. Apparently, there are no definite records of the ancestry of these hybrids except that *moschata* or its varieties played an important part. The presumption is that this species crossed with garden varieties of the Hybrid Tea and Noisette groups gave rise to the Pemberton roses.

Climbing Roses

At this point it is perhaps well to turn our consideration to the roses used for furnishing pergolas, pillars, trellises, festoons, etc. Many different species have been involved in the production of roses for these purposes.

Austrian Brier Hybrids

Rosa foetida. Le Rêve and Star of Persia are two Austrian Brier hybrids referable to this species, the former being the result of a cross between Mme. Eugene Verdier (H.P.) and Persian Yellow, a variety of *R. foetida.*

Aryshire Roses

Rosa arvensis. The Ayrshire Roses originated from this species, cultivated in Europe since 1750. They are used to a considerable extent in English gardens but are extremely scarce in this country. The group is represented in our garden by the variety Ruga, the result of a cross between *R. arvensis* and *R. chinensis.*

Banksian Roses

Rosa Banksiae. The Banksian Rose is an evergreen climber, not hardy except in regions having mild winters. It is a cluster-

FIG. 5. Rose Prosperity on posts. June 7. (6960)

flowered rose, forms of which may have single or double flowers, in either white or yellow, similar in shape to those of flowering cherries. This rose, under favorable conditions, is capable of phenomenal growth. Deslongchamps tells of a specimen growing in the Jardin de la Marine, at Toulon, which, in 1842, had a trunk two feet four inches in circumference, its branches covering a wall seventy-five feet long and eighteen feet high. The Banksian Rose is represented in the conservatories of the Brooklyn Botanic Garden, but although we have had it many years, never a flower has it produced.

Bourbon Roses

Rosa chinensis × *Rosa damascena* var. It is supposed that from this cross there were derived the Bourbon roses, so-called because they originated in the Isle of Bourbon (Réunion),[1] where they were discovered by M. Bréon, Directeur du Jardin Botanique de l'Isle de la Réunion, in 1817. (Rehder gives the origin of the Bourbon Roses as *R. chinensis* × *gallica*.)

The following account of the origin of the Bourbon Rose is given by M. Bréon as quoted by S. B. Parsons in "The Rose":[2]

"At the Isle of Bourbon, the inhabitants generally inclose their land with hedges made of two rows of roses; one row of the common China Rose, the other of the Red Four Seasons. M. Perichon, a planter in the island, found in one of these hedges a young plant, differing very much from the others in its shoots and foliage. This he transplanted into his garden. It flowered the following year, and proved to be of a new race, and very different from the above two roses, which at that time were the only varieties known in the island."

The rose known as Four Seasons was derived from *R. damascena*.

Some of the Bourbon roses are vigorous enough to be used as pillar roses or for training on a trellis. An example is Zephirine Drouhin.

Boursault Roses

Rosa pendulina (*R. alpina*)—the Pyrenees Rose. From this species, probably by crossing with *R. chinensis*, the Boursault

[1] The location of L'Île Bourbon has erroneously been attributed to Martinique, and to Mauritius (Île de France), by writers on the rose.

[2] New York, John Wiley. 1860.

roses were originated by M. Boursault, a French amateur rosarian. They are hardy, almost free from prickles, and suited for training as pillar roses. The variety Gracilis is said to be one of the best. The only Boursault rose we have been able to obtain is *R. Lheriteriana* which is growing in the west border near the center.

Brownell Roses

During recent years rosarians have been much interested in roses emanating from the Brownell Rose Research Gardens. The Brownells have been working for about thirty years in combining rose species, especially *R. Wichuraiana*, with certain Hybrid Teas and Pernetianas with the objective of garden rose betterment.

The Brownell roses to date can be roughly classified into three divisions:

1. Hardy *Rosa Wichuraiana* climbers with fragrant Hybrid Tea type flowers. It is claimed that they are especially noteworthy for clear yellow, fade-resistant coloration, and yellow in combination with red and with white.

2. "Sub-zero Hybrid Teas," not being climbers, do not concern us in this grouping.

3. Creeping or trailing roses with glossy foliage, and fragrant Hybrid Tea type flowers. These may be tied upright or used as ground covers.

The well-known Mrs. Arthur Curtis James (Golden Climber) which has large yellow flowers on long stems is the only Brownell rose which has been in our garden long enough to give a good account of itself. Other varieties planted last fall include: Apricot Glow, Elegance, Peggy Ann Landon, Golden Pyramid, Golden Glow, and Peggy. The creeping or trailing varieties are represented by Frederick S. Peck, Coral Creeper, Little Compton Creeper, Carpet of Gold, and Creeping Everbloom.

Cherokee Roses

Rosa laevigata, the Cherokee Rose, is a native of China, naturalized from Georgia to Florida and Texas. This species is one of the parents of the well-known and widely planted Silver Moon, one of the most vigorous of climbing roses.

Evergreen Roses

Rosa sempervirens, the Evergreen Rose, is a semi-evergreen from Southern Europe and North Africa. It is the parent of several garden forms represented in this garden by Félicité et Perpétué, apparently the only variety of this group in American commerce. It was raised at the Château de Neuilly by M. Jacques and introduced in 1828. It is a delightful, fragrant rose with flesh-colored flowers changing to white.

Gigantea Hybrids

Rosa odorata var. *gigantea*. This is a vigorous variety of the Tea Rose from southwest China and Burma with single, creamy white flowers, four to six inches in diameter. This variety, or a form of it, has been used by hybridizers in the production of climbing roses. The firm of C. Nabonnand of Cannes, France; Alister Clark of Victoria, Australia; and the Rev. George M. A. Schoener of Santa Barbara, are amongst contemporary workers with this form. The race of Hybrid Giganteas was represented in this garden by Comtesse Prozor. The hardiness of this group in the north has yet to be proved. Comtesse Prozor in our garden succumbed to the winter of 1933–34.

Hybrid Perpetual Climbers

The Hybrid Perpetual rose, Frau Karl Druschki, and a Hybrid Tea, Château de Clos Vougeot, were combined by Señor Pedro Dot to produce Madame Grégoire Staechelin, which may well be the forerunner of a new race of hardy climbers.

Hybrid Tea Climbers

Hybrid Tea climbers in general are rampant sports or mutations of bush kinds of the same name. They are inclined to be somewhat tender and do not bloom so freely over so long a season as the Hybrid Teas. Varieties that have proved fairly satisfactory in our garden are Climbing Lady Ashtown, Climbing Los Angeles, and Climbing Richmond.

Macartney Roses

Rosa bracteata. The Macartney Rose is an evergreen from China naturalized in the southern states. An outstanding hy-

brid of this species is the variety Mermaid which is said to stand temperatures as low as 4° above zero without protection. This variety is a lovely rose with enormous, single blossoms of pale yellow and white, and does well here with winter protection. Marie Leonida, probably not in cultivation in America, is said to be a hybrid of this species and *R. laevigata*.

Multiflora Roses

Rosa multiflora is a species from Japan and Korea that has already been referred to when writing of the species; and in connection with the Lambertiana roses. Its ally, *R. cathayensis* var. *platyphylla* (Greville or Seven Sisters Rose) has large double flowers of deep pink. This is thought by some to be the parent of Crimson Rambler, although, according to Ellen Willmott, in "The Genus Rosa," nothing is known of the origin of Crimson Rambler. The original plant was sent from Japan to England in 1878 and was at first called The Engineer. It came into the hands of a firm of nurserymen (Turner's) at Slough who changed the name to Crimson Rambler. This rose is one of the finest and most floriferous of the red climbers in sections where it will grow well. Unfortunately, it is extremely susceptible to mildew which has blackened its reputation. It is the parent of many hybrids. *Rosa multiflora* and its varieties are the ancestors of "multiflora" climbers such as Blush Rambler, Dawson, Roserie, Tausendschön, and Veilchenblau. (See also under species and Polyantha roses.)

Musk Roses

Rosa moschata. This species has already been referred to in connection with the Historical Group and the Pemberton Roses. *Rosa moschata* is one of the parents of the Noisette group of roses which were originated at Charleston, South Carolina, by John Champneys, who crossed *R. moschata* with *R. chinensis*. Descendants of this cross were sent by Philippe Noisette to his brother in France. From these, by further crossing, probably with varieties of the Tea Rose, the Noisettes were produced. The climbing roses in this group are tender but are valuable for the South and for greenhouse cultivation. Famous varieties among the Noisettes are Maréchal Niel and William Allen

FIG. 6. View showing double arches. (6892)

Richardson. I can plainly remember the glowing orange flowers of the last named growing on the walls of our home in England when I was quite a small boy.

Prairie Roses

Rosa setigera. The part that this native species has played in the production of climbing roses has been noted under Rose species. It may be worth mentioning that it is reputed to be one of the parents of that sterling variety, American Pillar, and is also represented in certain hybrids made by M. H. Horvath, an Ohio hybridist, among which the yellow climber Doubloons is prominent.

Tea Climbers

Tea climbers are less hardy than those in the H. T. group. The only climbing Tea rose in this garden is Gloire de Dijon (introduced to commerce in 1835) but its performance here is not such as to warrant recommendation for general planting as far north as Brooklyn.

Wichuraiana Roses

Rosa Wichuraiana. The Memorial Rose has entered largely into the make-up of our modern climbers. The influence of this glossy-leaved species is plainly to be seen in such well-known varieties as Dorothy Perkins and Excelsa. *Wichuraiana* hybrids are largely the work of American hybridists. The first hybrids were produced at Newport, Rhode Island, by M. H. Horvath, probably about 1893. His work was followed up by W. A. Manda, M. H. Walsh, Captain Thomas, and others in this country and by Barbier & Co., F. Cant & Co., William Paul & Son, and others in Europe. By far the largest proportion of the climbing roses of today have *Wichuraiana* "blood" in them.

The ancestry of many of the modern climbing roses is inextricably mixed. Hybrid Perpetuals, Teas, Hybrid Teas, and Pernetianas, themselves of mixed ancestry, have been hybridized with *moschata*, *multiflora*, and *Wichuraiana* species and garden varieties in all sorts of combinations, so that it becomes increasingly difficult to say definitely to which group many of the newer roses really belong.

The term "climber" applied to roses used for the adornment of pergolas, arches, etc., is in part a misnomer. Some roses, if given a suitable support, can climb unaided by means of long straight shoots armed with recurved prickles which catch on the support and prevent the shoot from falling. Many, however, of the so-called climbing roses are trailers, scramblers, or bush roses with thin pliable canes which makes them adaptable for training on trellis, pergola, or pillar. They exhibit great variety in their habit of growth and size and form of flowers. Some such as Dr. Van Fleet, Silver Moon, and Mary Wallace have tremendous vigor. The last named, even in the unfavorable environment of Brooklyn, has made shoots eighteen feet long in one season of growth. Some such as Birdie Blye, Climbing Orleans, and most of the climbing Hybrid Teas are of moderate growth suitable for training on posts not over six feet high.

Their flowers may be single or double; produced singly or few in a cluster, in which case the flowers are usually large as in Breeze Hill, Dr. Van Fleet, and Madame Grégoire Staechelin; or, they may be in many flowered clusters, when the individual flowers are usually small as in Bloomfield Courage, Dorothy Perkins, and Excelsa.

Rose hybridists have for some time been working towards the ideal of hardy everblooming climbers. The climbing H. T.'s have the recurrent blooming habit to a certain extent, but they are by no means so constantly in bloom as their bush counterparts. Climbing mutations of Dwarf Polyanthas, such as Cl. Orleans and Cl. Clothilde Soupert, are cluster-flowering types of more or less "everblooming" habit. The originations of Captain Thomas, such as Cascadia and Bloomfield Decoration from crosses of hybrid musk × Hybrid Tea, and hybrid Wichuraiana × Lambertiana roses are worthy of mention in any discussion of roses of long blooming habit. New Dawn, the first plant to be patented in the United States, has "everblooming" qualities. This rose is a mutation of the popular Dr. W. Van Fleet. Blaze, which has been described as an everblooming Paul's Scarlet Climber (Paul's Scarlet × Gruss an Teplitz?) is another rose of much promise but erratic performance.

Roses are as temperamental as potatoes in their reaction to

environment, and it is to be expected that conflicting reports on the behavior of these "everblooming" climbers will be received. In some gardens, they will doubtless live up to their reputations; in others, we may expect to learn that they give a good display in early summer, possibly supplemented by a few more blooms in the fall.

In our garden, the climbing roses are scattered. Strong growers will be found on the pergolas and pavilion; strong and moderate growers on the fence surrounding the garden and on the double arches that span the main walks; "pillar" kinds are spaced at intervals along the "species" borders. Roses suitable for ground covers are planted on the terrace banks around the pavilion, on the bank to the north, outside the Rose Garden proper, and on the banks around the Rose Arc. A feature of the garden is the two rows of concrete posts, connected with chains, that extend the whole length of the side beds of the central panel. These posts were designed by our Consulting Landscape Architect, Mr. Harold A. Caparn, and the forms were made and posts cast by our own men as part of their winter's work. These posts and chains are for the support of rose festoons. Dorothy Perkins, Excelsa, Hiawatha, Paul Noël, Bloomfield Courage, are among the varieties used.

There are about eighty varieties of "climbing" roses in the garden. Following is a selection of varieties that have given a good account of themselves here. The following terms are used in describing them: "Large," capable of reaching twenty feet or more; "Medium," ten to fifteen feet; "Pillar," six to ten feet. The term "Rambler" is applied to roses having canes which are not very permanent. The flowering shoots of this class should be cut to the ground after blooming. These grow eight to fifteen feet. The heights given are based on the growth made in the Brooklyn Botanic Garden.

Albertine. Medium. Flowers large, coppery chamois yellow, double.

Alida Lovett. Medium. Flowers large, pink, double.

American Pillar. Large. Flowers two inches in diameter, single, scarlet-rose, white centers.

Bloomfield Courage. Medium. Flowers small, clustered, dark red, white centers, yellow stamens, single.

Coralie. Pillar. Flowers large, orange salmon changing to pink; semi-double.

Dorothy Perkins. Rambler. Flowers small, clustered, pink, double.

Dr. Huey. Pillar. Flowers large, clustered, dark crimson maroon, semi-double.

Dr. W. Van Fleet. Large. Flowers large, well formed, pale pink, double.

Excelsa. Rambler. Flowers small, clustered, scarlet-crimson, double.

Hiawatha. Rambler. Flowers small, clustered, carmine, white centers, yellow stamens, single.

Jacotte. Medium. Flowers large, orange yellow, tinted copper-red, semi-double.

Le Rêve. Pillar. Flowers large, bright yellow, tinted copper, semi-double.

Mary Lovett. Medium. Flowers large, double, white; plant not very healthy.

Mary Wallace. Large. Flowers large, bright pink, double.

Miss Flora Mitten. Large. Flowers large, pink, yellow stamens, single.

Mme. Grégoire Staechelin. Medium. Flowers very large, slightly frilled, pink stained crimson, semi-double.

Mrs. Arthur Curtis James (Golden Climber). Flowers large, clear yellow, double, on long stems.

New Dawn. Medium. Similar to Dr. Van Fleet, but "ever-blooming" and less vigorous.

Paul's Scarlet Climber. Pillar. Flowers large, scarlet, double.

Prosperity. Pillar. Flowers medium, white, rosette-like, double.

Silver Moon. Large. Flowers large, white, single.

Star of Persia. Pillar. Flowers large, yellow, semi-double.

Thelma. Medium. Flowers medium, clustered, coral-pink, double.

White Dorothy. Rambler. Flowers small, clustered, white, double.

FIG. 7. View looking south-west. The bed in the foreground contains Soleil d'Or, Pernetianas, and some of the newer Hybrid Teas. (6965)

The Central Panel

There are three rows of five beds each in the central panel. These are planted with roses of the following groups: Noisette, Bourbon, China, Tea, Hybrid Tea, Pernetiana, Polyantha, and Hybrid Perpetual. The original plan called for "standard" or "tree" roses planted at intervals down the centers of the beds, but as these roses make unsatisfactory growth in this general neighborhood, it was decided to omit them.

Noisette Roses

Starting at the north end of the west row, *Rosa moschata*, *R. chinensis* var. and *R. odorata* var. (Tea Rose) are planted to illustrate the ancestry of the Noisette roses. As mentioned previously, this group is not very hardy and thus it is represented here by only two varieties, Madame Plantier, 1835, and Fellemberg, 1857. It is doubtful if the last named really belongs with the Noisettes. Some authorities place it with the China or Bengal roses. Miss Willmott gives its parentage as *R. chinensis* × *multiflora;* this would take it out of the Noisette group. Mme. Plantier is one of the oldest of the easily obtainable Noisettes. It is covered in June with its pure white flowers, but is not remontant. Fellemberg, on the other hand, produces its bright crimson flowers almost continuously from June to frost. In neither of these varieties do the flowers have much "form," which makes its appearance in this group only in those varieties where the Tea strain predominates.

Bourbon Roses

Following the Noisettes is a small group of Bourbon roses. The probable origin of this group in 1817 (*R. chinensis* × *damascena* var. Four Seasons) has already been dealt with under Climbers (p. 178). So far, we have been able to obtain only a few varieties of Bourbon roses. They are, in the main, weak shrubs, or pillar roses. Zephirine Drouhin is one of the best in this class.

China Roses

Following the Bourbons, there is a planting of a few rows of China or Bengal roses. These are probably hybrids of *Rosa*

chinensis, the Chinese Rose, and *R. chinensis* var. *semperflorens*, the Chinese Monthly Rose. The first Chinese Rose was introduced in England in 1789. Among the beautiful or interesting varieties of this group planted here are the following:

Fabvier (1832) with semi-double, bright crimson flowers, with white markings on the petals, very cheerful, and floriferous.

Hermosa (1840) double flowers of soft pink, constantly in bloom.

Comtesse du Cayla (1902) is unlike any other rose. It has distinctive, beautiful foliage, and flowers of reddish orange and yellow. It sometimes dies without apparent reason.

Hofgartner Kalb (1914) is almost constantly in bloom. It has deep pink flowers on a strong-growing, bushy plant, and is one of the showiest roses in the garden.

Gloire des Rosomanes (1825) which has long, flexible stems, suitable for training on a pillar, is of interest as being the "Ragged Robin" much used as an understock for H. T. and Pernetiana varieties, especially in California.

The Green Rose, *Rosa chinensis* var. *viridiflora*, has ugly but interesting flowers about the size of a fifty-cent piece. The petals appear as small green leaves.

Tea Roses

Following the China roses there are about fifteen rows of Tea roses. These are forms of *Rosa odorata*, introduced to England from China in 1810 and 1824. The first one to arrive had pink, double flowers and was followed by the double yellow. These varieties were exported to France and, as a result of cross-breeding, mainly by French growers, the race of Tea-scented roses was developed. Nicolas records that at the Roseraie de l'Hay, "in 1902 the class was represented by the respectable number of 1050 named varieties. . . ." The history of these double flowered forms of *Rosa odorata*, prior to their introduction to Europe, remains obscure. Tea roses, mainly because of their lack of hardiness, are not largely grown in the North. They are free bloomers but the flowers are not well displayed, as most varieties have weak pedicels which gives them a drooping appearance. Varieties which grow well here are: Duchesse de Brabant, Madame Antoine Mari, Harry Kirk, and Lady Hillingdon.

FIG. 8. Rose Soleil d'Or. The forerunner of the Pernetianas. (6963)

Hybrid Tea Roses

Following the Tea roses, the remaining beds on both sides of the central panel (nine in all) are planted with Hybrid Tea roses, by far the most popular group at the present time. The ancestry of this class is illustrated in the north east bed by a plant of Madame Victor Verdier (1863), representing the Hybrid Perpetuals; by a Tea rose; and by a plant of Soleil d'Or, which, crossed with Hybrid Tea varieties, gave rise to a new race, the Pernetianas, of which more will be said later.

The first Hybrid Tea rose to be introduced is the variety La France (1867), originated by Guillot fils, of Lyons, France, the parentage of which was Mme. Victor Verdier (H. P.) and Mme. Bravy (T.). It has been estimated that the number of named varieties of Hybrid Tea roses at the present time is around ten thousand.

Originally the H. T.'s in this garden were planted in a chronological order according to the date of their introduction. This method of planting was designed to illustrate the progress of the rose, but it is doubtful if the purpose was fully accomplished. It cannot be said that the introductions represented of any one year were a fair cross section of the roses of that year, and, more particularly, when earlier years are in question. The less desirable varieties pass out of commerce and out of cultivation, and the condition arises of the best varieties of earlier years coming into comparison with "run of the mill" varieties of recent times. As an illustration of the tendency of poor varieties to pass out of commerce, it may be mentioned that recently, in several instances, when replacements were necessary due to death of some varieties planted in 1927–28, we were unable to obtain them as they were no longer being grown commercially. Because of this we no longer attempt to maintain a chronological sequence, except in the north east bed.

Among the outstanding varieties as we proceed towards the pavilion are the following:

Mme. Caroline Testout (1890), a pink rose used largely in street plantings in Portland, Oregon.

Chateau de Clos Vougeot (1908), of peculiar, almost horizontal

habit of growth, whose fragrant flowers of velvety dark crimson redeem it from oblivion.

Radiance (1908), which, if symposia conducted by the American Rose Society a few years ago are any criterion, used to be America's favorite H. T. rose.

Duchess of Wellington (1909), still one of the best of the yellow roses, in spite of its being thirty years since it was introduced.

Los Angeles (1916), which Nicolas says should be pulled out of every garden and burned because it is the "worst of all" varieties as an uncontrollable source of "black spot" infection, is, strangely enough, one of our best roses, which has grown well for the past ten years.

Mrs. Charles Bell (1917), a sport of Red Radiance, with globular blooms of shell pink.

Étoile de Hollande (1919), by many considered the best red H. T.

Rev. F. Page-Roberts (1921), a low, spreading bush, with roses of glorious form and color (golden yellow, flushed with red) but too few of them.

Mme. Léon Pain (1904), very floriferous, with fragrant, flesh-pink flowers of good form.

Mrs. Lovell Swisher (1926), so far as color is concerned is just another pink rose, but its flowers are large, of good form, and freely produced on long stems. It is a vigorous and healthy grower.

Mrs. Erskine Pembroke Thom (1926) is by many considered the best yellow rose. It has done well with us.

Margaret McGredy (1927) is remarkable for its gorgeous coloring of orange vermillion, especially when it first opens. The flowers are large, the plant vigorous and almost constantly in bloom.

Among the comparatively new roses, the following stand out as being thoroughly worth while, in this garden, at any rate.

Leonard Barron (1931) has large, double flowers with coppery salmon centers surrounded by a collarette of shell-pink petals. Apart from being a good garden rose, it is of great interest because of its ancestry. The Rev. G. M. A. Schoener, by crossing *R. nutkana*, a wild rose, whose range extends from Alaska to

Wyoming and California, with a H. P. (Paul Neyron), produced Schoener's Nutkana. This variety was combined by J. H. Nicolas with Souvenir de Mme. Boullet, a Hybrid Tea, from which cross the rose called Leonard Barron originated. This may perhaps be considered the forerunner of a new strain of Hybrid Tea roses.

Condesa de Sastago (1933). Coppery-red petals with golden-yellow reverse, fragrant and a good grower.

Eclipse (1936). Slender yellow buds which have been described as "streamlined." The opened flowers hold their color well.

Hinrich Gaede (1931). Flowers of orange-yellow flushed with nasturtium-red.

McGredy's Yellow (1933). One of the best of the new roses, with color described as canary yellow.

Signora (1934). A tall plant with long buds of burnt sienna, paling as the flower opens.

Texas Centennial (1935). A sport of President Herbert Hoover, with flowers of bright red changing to deep pink.

Will Rogers (1936). A man's rose. Flowers fragrant, of rich, dark, velvety crimson.

Anyone studying this group of Hybrid Teas—there are about two hundred varieties planted here—will notice several interesting things about them. One is the scarcity of good red and good white H. T. roses. As a matter of fact, there is no really satisfactory white H. T. rose in the Brooklyn Botanic Garden. Kaiserin Auguste Viktoria (1891) has a good reputation as a white rose, but is more or less a failure with us; Mme. Jules Bouche (1911) is perhaps the best here.

Another point of interest is that roses with glowing yellow and orange coloring do not appear until after the advent of the first Pernetianas in 1900. Previous to this, all the yellow coloring in H. T. varieties came, apparently, from *Rosa odorata* var. *ochroleuca*, whose flowers are soft, pale yellow.

It will be noticed that some varieties, notably Gruss an Teplitz (1897) and Ecarlate (1907), look quite different from the general run of H. T. varieties, which, although varied in size, form, and color, do have a general family resemblance. We have followed

"Standardized Plant Names" in including these varieties among the H. T.'s, although, on the basis of appearance, they should be included with either the Bourbon or China group.

Pernetianas

This strain was originated by M. Pernet-Ducher by crossing Antoine Ducher, a Hybrid Perpetual rose, with Persian Yellow, a variety of *Rosa foetida*. As we have not been able to find a source for Antoine Ducher, General Jacqueminot has been planted with Persian Yellow to indicate that a Hybrid Perpetual played a part in the ancestry of the Pernetianas. A result of this cross was Soleil d'Or (1900), a rose marvelous in color but of cantankerous temperament, which amazes us by growing fairly well here. Combination of this variety and its progeny with Hybrid Tea roses gave us the Pernetianas, some of which, by reason of frequent intercrossing, are practically indistinguishable from Hybrid Teas. Because of this only the earlier introductions—Beauté de Lyon (1910) (unnamed seedling × Soleil d'Or), and Juliet (1909) (Captain Hayward × Soleil d'Or) are included in this group—the remainder of the Pernetianas being planted among the Hybrid Teas.

The amalgamation of *Rosa foetida* with H. T. roses greatly increased their color range and, unfortunately, their susceptibility to leaf diseases.

Dwarf Polyanthas

The center row of beds contains Hybrid Perpetual roses with a border of Dwarf Polyanthas. Beginning at the north end, we have *R. multiflora* var. and Fabvier (representing *chinensis*) to suggest the probable parentage of the Dwarf Polyanthas. Just how this group originated is not very clear. The probabilities are that some of them were the result of crosses between *chinensis* and its varieties with *multiflora* forms; some are probably seedlings of *multiflora* and *Wichuraiana* climbers (with possibly *chinensis* in their make-up), which developed a dwarf habit; and some are bud sports or mutations of climbing roses. An example of the latter mode of origin is Echo, which is a bud sport of the climbing rose Tausendschön. It is recorded that Pâquerette, the

FIG. 9. Rose Dr. Huey on pillar. June 11. (8203)

first Dwarf Polyantha, was the result of a cross between *R. multiflora* and a double-flowered garden rose. The progeny contained tall and dwarf varieties—Pâquerette being among the latter.

Rosa foetida has been combined with the Dwarf Polyanthas in Tip Top whose parentage is Trier × Austrian Copper. Noisette influence is represented by William Allen Richardson, one of the parents of Eugenie Lamesch; and the Hybrid Teas have not been entirely left out, for Salmon Spray acknowledges a Hybrid Tea (Midnight Sun) as one parent, and Richmond, another H. T., enters into the make-up of Joseph Guy, better known in this country as Lafayette.

The Dwarf Polyanthas are constantly in bloom from June until frost and in some gardens are being used to replace geraniums in bedding schemes. Their hardiness, free blossoming qualities, and the fact that they do not have to be replanted every year commend them for this purpose.

Outstanding varieties are the following:

Cecile Brunner, sometimes called Mignon and Sweetheart, with pale pink flowers with yellowish centers, which, in bud, are perfect replicas in miniature of typical Tea roses. Unfortunately, it does not survive our winters any too well.

Eugenie Lamesch and **Leonie Lamesch,** both introduced by Peter Lambert in 1899, are charming varieties with unusual and changeable coloring. The former has orange-yellow buds tinged with red. They open out to flat, double flowers, yellow in color, changing to pink with age. About 2 ft. high. Leonie Lamesch has bright coppery red flowers with golden centers. About 1 ft., 6 in. high.

Clotilde Soupert is a quaint, old-fashioned-looking rose, with very double, white flowers that have a tendency to "ball." It is a free bloomer and well worth growing. About 2 ft., 6 in. high.

Aennchen Müller is one of the best of the pink Polyanthas. It has fairly large flowers produced in large clusters. About 2 ft. high.

Yvonne Rabier is perhaps the best of the white Polyanthas. Its glossy, bright green foliage and compact bushy habit of growth further commend it.

Miss Edith Cavell has quantities of small, dark scarlet-red flowers produced over a long season. A similar variety is Ideal which has flowers that are darker and inclined to blacken in hot weather. Both varieties are strong growers—about 2 ft. high. Miss Edith Cavell is a sport of Orleans and Ideal is a sport of Miss Edith Cavell.

Eblouissant is one of the dwarfest of the Polyanthas. It has dark red flowers shaded with velvety crimson, with the petals quilled like those of cactus dahlias—a fine variety.

Joseph Guy (Lafayette) is noteworthy for the large size of its freely produced light crimson flowers. Many consider this the best Dwarf Polyantha. It is a strong grower.

Chatillon is one of the showiest of all. It has bright pink flowers with white centers, produced in large clusters.

"Floribunda" Roses

During recent years the name "Floribunda" has unofficially been applied to a group of roses whose limits are somewhat nebulous. In general they are large-flowered clustered roses partaking of the characteristics of Polyanthas and Hybrid Teas. Representatives of this group including Salmon Spray, Joseph Guy, World's Fair, and Holstein are to be found in this garden among the Polyanthas.

Hybrid Perpetuals

Most rose authorities seem fairly well agreed that four roses enter into the make-up of the Hybrid Perpetuals, namely, *chinensis*, *gallica*, *damascena*, and possibly *centifolia*. Some rosarians believe that the last two named are derivatives of *R. gallica*.

Representatives of these four roses are planted at the north end of the line of Hybrid Perpetual beds to indicate the ancestry of the group. The line of development, as suggested by Rehder, was probably somewhat as follows: *chinensis* × *damascena* var. (or, possibly, *gallica*) produced the Bourbon rose. This variety × *gallica*, *damascena*, and *centifolia* (all belonging in the *Gallicae* group) resulted in the Hybrid Bourbons, which, crossed with *chinensis* and its varieties, produced the Hybrid Perpetuals.

During recent years the Hybrid Perpetuals, except in regions

having severe winters, have been almost entirely over-shadowed by the rise of the Hybrid Tea group. The result of this is that the number of H. P. varieties offered by commercial growers is greatly reduced and critical rosarians are inclined to be skeptical of the authenticity of the names of many of those that are offered.

Hybrid Perpetuals are capable of giving another crop of blooms in the autumn in addition to their main display in June. Some of the newer Hybrid Perpetuals, due to admixture of Hybrid Tea blood, have everblooming tendencies.

The following is a selection of H. P. roses that have done well with us.

General Jacqueminot. This is a good rose, but it is doubtful if our plants, received from several sources, are true to name. Old time rosarians say it is not the General Jacqueminot they knew in their young days, and the color of the flowers of our plants does not fit the published description of "brilliant velvety crimson, with darker shadings."

Prince Camille de Rohan, sometimes called The Black Rose. Its dark red flowers shaded with blackish maroon are of good form and are fragrant.

Paul Neyron has large, rose-pink, fragrant blooms. Flowers sometimes ball in wet weather. Its neighbor Baroness Rothschild has pale pink, well-formed blooms, but lacks fragrance.

Magna Charta has large, carmine pink, very double flowers, which are heavily perfumed. Usually blooms in June only.

Gloire Lyonnaise, with white, very double flowers of large size, yellowish towards the center, is faintly tea scented.

Captain Hayward, scarlet-crimson, fragrant flowers, large, not fully double.

Frau Karl Druschki is mentioned here, not that it does well with us, but because, when it is well-grown, it is the handsomest white rose in existence. Not fragrant.

Gloire de Chedane-Guinoisseau has deep crimson flowers, well-formed and of large size.

Candeur Lyonnaise is a seedling of Frau Karl Druschki. Its flowers are white tinted with creamy yellow.

Madame Albert Barbier introduces a yellow tone, rare in the

H. P. group. It is more or less everblooming. The bases of the petals are tawny yellow with creamy tips.

Cultivation of Roses

It is axiomatic that garden roses do not like wet feet—therefore, the beds where they are to be grown should be well-drained. If the sub-soil is of such a nature that surplus water does not naturally drain away, artificial drainage must be provided. This may be accomplished by laying tile drains with a slight but uniform slope so that the water may drain into a sewer, open ditch, or "sink away," or the bed may be excavated two or three feet deep, and six inches of broken stone, bricks, clinkers or coarse ashes placed in the excavation before returning the soil. Sods placed grass side downwards immediately over the drainage will prevent it from clogging.

Soil. Roses may be made to grow in almost any kind of soil provided it is suitably enriched with manure, but most varieties prefer a rather heavy loam. The soil should be prepared by double digging, preferably eighteen inches or two feet deep, although, if the soil is naturally rich, it is possible to get by with only a foot of prepared soil. When making the beds, take advantage of the opportunity to *mix* plenty (up to one-fourth of the bulk of soil) of decayed manure with the lower nine inches of soil. If the lower level is taken care of when the beds are made, it is easy to fertilize the upper nine inches at any convenient time in the future. Preferably, the ground should be prepared a month or two ahead of planting time to give it an opportunity to settle.

Planting. Roses may be planted either in fall or spring. Both seasons have their advocates. Our experience at the Brooklyn Botanic Garden indicates that it is six of one and half-a-dozen of the other, but if spring planting is adopted it must be done as early as it is possible to work the soil. Dig a hole large enough to accommodate the roots without crowding, spread them out, scatter fine soil in amongst and over them and *pack firmly* by trampling. Mrs. B. A. Jackson, writing in "The American Rose Magazine," a publication of the American Rose Society, suggests filling a flower pot with earth and then turning it out in the center

FIG. 10. Rose Climbing Los Angeles on pillar. June 11. (8202)

of the hole. This provides a little mound that, to those unaccustomed to plant, greatly facilitates the proper spacing of the roots. Do not set the plants too deeply. The "elbow" or point of union between stock and scion should be about one inch below the surface. If planted in the fall, about one half of the top growth should be cut off and the bushes protected against the winter (see Winter Protection). If planted in the spring, remove all weak shoots and cut the remainder to within about six inches of the ground level. It is a good plan to mound newly set roses with earth which should be removed when growth starts. It is the general opinion that field grown, budded roses are to be preferred as planting material.

Summer Care. Keep the surface soil cultivated to maintain a dust mulch through the summer and early fall; or mulch the beds with peat moss, or with buckwheat hulls. A few years ago, we compared the results obtained from the use of the above three methods. It was almost impossible to see any difference in the three beds selected for experimentation—if any, it was in favor of the one mulched with peat moss.

Fertilizing. Our general practice (subject to occasional variations) is to apply a heavy dressing of cow manure in the fall (to be described later); plus a complete commercial fertilizer (about 4–8–6) in the spring at the rate of 2 lbs. to 100 sq. ft., plus superphosphate at the end of July at the rate of about 5 lbs. to 400 sq. ft. Many rose growers however, especially if their aim is to produce extra large, or exhibition blooms, prefer to give supplementary feedings throughout the growing season. Liquid manure may be applied to the soil when the first flower buds show and again a few weeks later. Or, a quick acting "complete" commercial fertilizer may be substituted, using a heaping tablespoonful to each plant. The soil should be well soaked with water before applying liquid manure or commercial fertilizers. Do not attempt to force your bushes to grow by fertilizing them during very hot weather. Do not give any quick-acting fertilizer after mid-August or it may result in the production of sappy growth unfitted to survive the winter. Bonemeal, as it is slow acting, may be applied in October. It will be available for the roses the following year. Use 3–4 lbs. to 100 sq. ft. If the

soil was properly prepared newly planted roses should not need additional fertilizer the first year.

Watering. Roses like plenty of water at the roots so long as it is not stagnant. Whenever the soil shows signs of becoming dry, water thoroughly so that the soil is wet to the depth of at least one foot. Apply the water to the soil and not to the foliage. Wet foliage allows the spores of "black spot" to germinate.

Pests. Perhaps the most dreaded pest of the rose grower in these parts is "black spot," a fungus disease which produces unsightly black and yellow areas on the leaves and subsequent defoliation. We are satisfied that the Massey dust, if faithfully used, affords an adequate measure of protection against this pest. This dust was devised by Dr. L. M. Massey, of Cornell University, and consists of 90 parts of dusting sulphur and 10 parts of arsenate of lead. We use a commercial preparation of this, containing colloidal sulphur, and a green dye which makes it less conspicuous on the foliage. It is applied preferably when the air is still and when the foliage is dry. We endeavor to coat both sides of the leaves with a fine film of the dust, which is not difficult when a duster of the "blower" type is used. The frequency of application is dependent upon the number of rainy days—during dry periods less dusting is necessary. The first protective coating is applied as soon as leaves are formed and we try to give the bushes a coating before every rainy period. Massey dust, when properly applied, does not disfigure the foliage to any great extent. It does sometimes cause discoloration of blossoms, but it is usually possible to avoid dusting while the roses are at the height of their bloom; and we accept the drawback of a few injured flowers as being infinitely preferable to defoliated and weakened bushes.

Massey dust also controls to a large extent stem cankers, mildew, and leaf-eating insects. Those insects that feed within the flower, such as Rose Chafers and Japanese Beetles, are best dealt with by hand picking and by grub-proofing with lead arsenate the lawns and grassy areas in the vicinity of the rose garden.

Aphids are extraordinarily fond of the young succulent growth

of roses. They are sucking insects and must be sprayed with a contact insecticide. We use nicotine-soap solution—½ pint 40% nicotine, 2 lbs. soap, 50 gallons water (1 teaspoonful nicotine, ¾ oz. soap powder, 1 gallon water). This must be sprayed on so that it comes in contact with the insects. Massey dust may be obtained with a nicotine content sufficient to kill aphids. It is thus possible to kill several "birds" with one stone!

Oyster-shell scales and San José scales sometimes attack the stems and branches of roses when cultural treatment necessitates a more or less permanent top growth. Rugosa hybrids seem to be especially susceptible. The remedy for scale insects is to cut out the branches most affected, if it does not spoil the shape of the bush, and thoroughly spray with lime-sulphur (winter strength), or a miscible oil, used according to directions of the manufacturer, just before growth starts in the spring. When the bushes are badly infested it may be necessary to spray again with nicotine-soap solution in early June when the young scales have just emerged from the eggs.

Winter Protection

When the foliage has been killed by frost the bush roses likely to be injured (Teas and Hybrid Teas) by the winters that we experience here are hilled up with soil taken from between the rows. The trenches thus made are filled with partly decayed cow manure, taking care to prevent it from coming in contact with the rose stems. This serves to protect the roots and to maintain fertility. The day after Christmas our truck visits neighborhood stores that deal in Christmas trees and collects the left-over trees (firs only). The branches are stripped from these and placed among the roses so that the tops of the latter are sheltered from wind and shaded from the sun. If, as sometimes happens, there is no glut of Christmas trees, we make use of salt hay and various ornamental grasses (*Eulalia*, etc.). The Tea roses being slightly more tender have a board fence two feet high built around them and an overhead covering of lath screens which shelter the roses but permit a free circulation of air.

Tender climbing roses—Climbing Hybrid Teas, Gloire de Dijon, Emily Gray, Jacotte, etc.—receive a protective covering

of manure on the soil over their roots. If growing on a pillar, the canes are tied closely and covered with cornstalks. If trained on a fence, the canes are taken down, tied together and wrapped in cornstalks or similar material; or they may be covered with earth.

Pruning [1]

In Spring. The art of rose pruning can be learned quite readily by anyone of average intelligence. All that is needed is a good grasp of the principles underlying pruning, upon which to proceed thoughtfully, with the understanding that although rules are helpful, each plant must be considered as an individual and pruned accordingly.

It may be accepted without question that pruning is necessary if best results are to be obtained. When there is a difference of opinion, it usually relates to the extent and severity of the pruning.

Pruning, as defined by Dr. L. H. Bailey, is "the removal of a part of the plant for the purpose of bettering the remaining part or its products." Thus, by pruning, we lessen the struggle for existence between the branches of the individual rose plant, and, as a consequence, improve the quality of the flowers. Pruning is a very important factor of aid in the control of plant diseases. The youth of the rose bush may be renewed by pruning; it is necessary to prevent the bushes from attaining an unwieldy size, and likewise to maintain a shapely plant free from the legginess that is natural to most unpruned rose varieties.

It has been said that one of the reasons for pruning is to lessen the struggle for existence between the branches that are produced by the rose. As an illustration of this we will assume that in the spring the average rose bush has 100 or more growth buds, all of which are capable of producing branches. As a matter of fact, not every one of these buds will develop, because those toward the top of the bush will "hog" the supply of sap with the result that some of the buds lower down will fail to grow. But

[1] The remarks on pruning, so far as they apply to spring work, are an adaptation of an address, given by the writer under the auspices of the American Rose Society, broadcast on March 15, 1932, through the WJZ studio of the National Broadcasting Company.

FIG. 11. Rose Miss Flora Mitten. Trained as a standard. June 10. (9084)

even allowing for this, too many of the buds will develop, resulting in so much competition that the branches are weak, and the flowers are small and wanting in quality. Many of the branches will fail to produce flowers at all, and some will start to grow only to be crowded out and killed by the remainder. Now supposing, in the spring, instead of leaving this rose bush unpruned, we thin out enough of the weak branches and old branches, and prune back the stronger canes, so that about twenty growth buds are left on the plant, the whole vigor of the root will then be concentrated on these buds instead of being dissipated over a large number of buds. Furthermore, the buds that are left are not too crowded, and, hence, have the opportunity to develop into strong shoots bearing large blossoms.

The second point is that pruning may be used as a help toward the control of disease. A great deal can be done to lessen the dangers of further infection by cutting out and burning those parts of the plant that are already suffering from disease. The various stem-cankers, if left without attention, are a source of infection for the healthy canes and for neighboring bushes and should be removed. Many rosarians believe that a rose bush that is properly pruned, with all weak branches removed and its center open to light and air, is better equipped to resist disease than one that contains a tangled mass of dead and dying wood.

The third point is that pruning may be carried out in such a way that the rose bush perennially renews its youth. All rosarians know that the finest roses are produced on maiden plants. (For the benefit of the uninitiated, it may be well to explain that the term "maiden" is applied to the rose making its first year's growth from the bud or graft inserted upon the supporting stock: in other words, a rose bush one year old, or less. The term is much more frequently used in England than in America.)

In the case of Tea, Hybrid Tea, and Hybrid Perpetual roses, with which we are mostly concerned at this time, the flowers are produced on shoots which arise from canes or branches of the preceding year, hence the importance of so pruning that there is no lack of strong, vigorous one-year-old wood. This is an essential point to keep in mind when pruning roses of this type. By cutting out the aged wood every spring, and leaving only the

strong, vigorous canes of the preceding year, we are enabled in a large measure to renew this quality of youthfulness in our roses.

Another principle that should be followed in rose pruning is that weak growers should be pruned severely in order to stimulate the production of vegetative growth, and thus provide a strong framework for another year, while strong-growing varieties should be pruned lightly—partly because heavy pruning is unnecessary, and partly to avoid the possibility of stimulating too much vegetative growth.

The cutting may be done with pruning shears or a pruning knife. There is little doubt that a better job can be done with a knife than with shears. The cut made by a sharp knife is smooth and clean, the bark is not bruised, and the wound more readily heals. However, the work may be carried out more expeditiously by the use of pruning shears, and if they are kept sharp, so that the branches are cleanly cut off and not mangled, a good enough job can be done. Heavy leather gloves, preferably with gauntlets, are indispensable except to those who accept a few scratches in preference to the heat, discomfort, and clumsiness of heavy gloves. A narrow blade pruning saw is desirable, for one is almost always sure to come upon thick old snags at the base of some of the bushes that need to be cut out, but which are too big to be handled with shears. If your gardening equipment does not run to a pruning saw, a keyhole saw is an effective substitute. A kneeling pad is an advantage, especially for those to whom long-continued stooping means a pain in the back.

If you want the full complement of equipment, you may add a pot of paint and a rather stiff paint brush, so that any large wounds may be covered with paint. A container with a 10% solution of formaldehyde, in which the pruning tool may be dipped after pruning a diseased plant, and before tackling a healthy one, is desirable. This, of course, is to disinfect the tools and thus prevent the spread of disease by them.

Time of Pruning—Teas and Hybrid Teas

In a normal season, get busy just as soon as the buds have started to grow. But such advice does not always apply; for in Brooklyn in some years many of the Hybrid Teas have as much

FIG. 12. West Walk, looking north through pergola. June 27. (8821)

as an inch or more of new growth in early February, which is far too early to prune roses in this neighborhood. In abnormal years many inquiries are received in February or early March from amateurs who ask if they ought not to prune their roses right away because they have started to grow. My advice is, *wait*! For this reason: The buds toward the top of the bush are usually the first to start into growth. If these are killed or injured by freezing, it does not matter much, for this part of the bush will be cut away anyhow. But pruning stimulates the lower buds into growth—the ones that you are relying on to provide your summer bloom—and if this is done too early in the year, a few mild days, followed by a freezing spell, may injure your rose bushes severely. Defer pruning until it is reasonably certain that the weather is settled and no more hard freezes are to be expected.

Pick out a nice warm day when it is comfortable to work out of doors, because you are not likely to bring to the job the leisurely consideration that is so desirable, should your nose be nipped by a howling wind and your fingers numb from cold. The poor professional, who has his thousands of roses to prune, and who has to get them all done within a specified time cannot, of course, be so choosey about the weather.

The first thing to do is to cut out all dead wood, and any weak and spindling branches arising from the base of the plant. Do not leave any stubs—always cut close to a main branch and cut clean. Next, look over the bush carefully and remove any diseased branches, cutting them out completely. Most canes that are more than one year old also should be cut out. When this has been done, the chances are that the remaining canes will not be too thickly placed for best results.

Now we come to the operation of pruning the canes that are left. If the object is to obtain a few blooms of the finest or "exhibition" quality, the plants should be cut back severely, so that only three eyes are left on each cane, and not more than three or four canes to each bush. If the preference is to produce a larger number of good flowers suitable for cutting, the pruning should be moderate, and the canes cut back to six or eight buds. But if a large number of flowers for garden display is desired prune lightly, removing only the tips of the canes.

When making the cuts, have in mind the future shape of the bush and cut to a bud pointing in the direction that you wish it to develop. In general, cut to a bud pointing outwards, for it is desirable to keep the center of the bush open. If the cut is made too far from the bud an unsightly stub is left. If too close, the bud may die. Make the cut about one-eighth of an inch above the bud.

Hybrid Perpetuals

With Hybrid Perpetuals, pruning procedure is much the same as that outlined above, except that, because they are in general much more vigorous, Hybrid Perpetuals, when pruned, would appear to have twice as much growth left as Hybrid Teas pruned on the same principle. In some cases, it may be desirable, instead of pruning back so severely, to adopt a method that is so commonly used in England—that of pegging down to the ground (so as to form an arch) the long canes of the preceding year, thus forcing into growth the buds along the whole length of the cane. This practice is usually productive of an enormous quantity of flowers, but not much in the way of quality.

Polyanthas, Bourbons, Chinas, and Others

Roses belonging in the Polyantha, Bourbon, and China groups need very little pruning beyond the removal of dead and worn-out wood. The same is true of climbing, rambler, and pillar roses *in the spring*. The climbing roses of the large-flowered type, such as Dr. Van Fleet and Breeze Hill, may, if necessary, be pruned to keep them within bounds and to remove old worn-out wood. Rambler roses—the small bunch-flowered type—of course will have to be pruned during the summer immediately after flowering and any pruning in spring is restricted to cutting back, very lightly, the unripe tips of the canes. Pillar roses and climbing Hybrid Teas as a rule need but little pruning other than the removal of old worn-out wood and spindling branches.

Walk warily when pruning such roses as Soleil d'Or, Juliet, the Austrian Briers, and "species" roses, such as *R. Hugonis*. These need very little pruning other than removal of branches that cross and rub, and perhaps occasionally some slight thinning.

Much harm can result from the too free use of knife or pruning shears on roses in these classes.

Rosa rugosa and its *Hybrids.* In this group it is better, on the whole, to restrict pruning to removal of dead, and insect-infested branches, and to the maintenance of a shapely bush. Occasionally, it may be necessary, especially in those varieties where *rugosa* characteristics are dominant, to rejuvenate the bush by cutting it to the ground in the spring.

It is desirable to emphasize once more the necessity of severely pruning newly planted roses. It is hard to convince novices that they must cut back their newly spring-planted roses to within six or eight inches of the ground. They seem to take the attitude: "Well, I've paid good money for this rose bush, and why should I cut off the major part of it and throw it on the trash pile." Perhaps one way of handling this problem would be to persuade the nurserymen to prune their roses ready for planting before shipping. There would be a saving on carrying charges and much less mortality amongst rose bushes. But, of course, and naturally, the nurseryman wants you to see what a fine rose bush he is sending you, and so, as a rule, he does not cut in back. Fall-planted roses should have the tops shortened only one-half, and be protected by mounding them as high as possible with soil, but do not fail to cut them back still more in the spring. It will assure a much better bush in the long run.

Don't be afraid of pruning too severely Hybrid Teas and Hybrid Perpetuals. Carry out your pruning thoughtfully and with observation. Watch the results of your pruning. We have to deal with hundreds of varieties and no general advice and no set of rules will apply equally well to all.

Summer Pruning

Summer pruning of roses is secondary in importance only to spring pruning. Certain types of roses, such as the Ramblers, can only be pruned to advantage during the summer. Among the varieties belonging in this group, which is sometimes called the "small bunch-flowered type," are Dorothy Perkins, Hiawatha and Excelsa. They may be distinguished from other climbing roses by the numerous new shoots arising from the base of the

plant about the time they are in bloom. They differ also in having canes that are relatively impermanent, and *strong* new shoots are not abundantly produced from canes that have blossomed but rather from the base of the plant as previously noted. Such roses should be pruned immediately they have finished blossoming, or as soon thereafter as is practicable. Pruning consists of the ruthless removal of all canes that have blossomed, which should be cut off as near the ground line as possible. Enough of the strongest young shoots should be left to fill the allotted space. The remaining weaker shoots may be cut off. Those that are left will grow vigorously throughout the summer and fall and from them will arise the following spring the laterals that will produce an abundant crop of blooms.

If for any reason increased height is required in roses of this class, it may often be gained by cutting back only to the strong shoots that occasionally arise on the canes from which the flowering shoots were produced.

The group of roses to which the term "large-flowered Climbers" has been applied, and examples of which are Dr. Van Fleet, Silver Moon, and Albertine, produce larger blooms with fewer in a cluster and are characterized by more permanent stems. They do not, as a rule, produce their young shoots from the base of the plant but from the canes of previous years.

Pruning in roses of this class should not be so severe as in the case of the ramblers. Because of their vigorous growth, they should never be planted except in positions where there is plenty of room for them to grow and spread themselves. Many varieties in this class produce their flower-bearing shoots in greatest profusion from the older wood. If limitations of space necessitate frequent severe pruning, too much unripened wood is produced which does not provide the greatest quantity of flower-bearing shoots.

Summer pruning of this class consists in keeping the plants within bounds. Pruning for the removal of *old worn-out wood* should be done in early spring before growth starts.

There is still another group of roses that makes rather long flexible canes to which the term Pillar Rose is applied. In this class, we find plants having the characteristics of both the afore-

mentioned types, differing in that growth is not nearly so rampant. As the name implies, they are suitable for training on posts or pillars and usually they do not attain a height of more than six or eight feet. In this group, we have such roses as Paul's Scarlet Climber, The Beacon, and various climbing Hybrid Teas. The kind of pruning required by these roses depends, of course, on whether they are of the rambler type, or whether they make more or less permanent woody canes. Those of the rambler type should be pruned as described in the first section above. Those that make permanent woody stems need, as a rule, very little pruning. Old, worn-out wood may be removed—preferably in the spring.

Summer pruning of Hybrid Tea roses is perhaps best accomplished by cutting the blossoms rather freely and using them for indoor decoration as cut flowers. When this is done, the flowers should be cut with a long stem, making the cut two or three leaves from the point of origin of the shoot. When the roses are cut in this manner you may expect the buds in the axils of the leaves, on the portion of the shoot remaining, to grow and produce flowers later in the season.

Another form of summer pruning that is very necessary is concerned with the removal of suckers that may spring up from the understock on which the garden rose is budded. If these suckers are not promptly removed, the chances are that by the end of the season, instead of having a Ville de Paris, Margaret McGredy, Mrs. E. P. Thom, or whatever variety you happen to have planted, you will have nothing but the wild rose on which the garden variety was budded. Any shoots originating from below the ground line should be viewed with suspicion and if the leaves that they produce appear different from those of the flowering rose, such shoots should be removed, if possible, by breaking them off below the ground line. The objective in view is the complete removal of the sucker so as to leave behind no dormant buds that will spring into growth later and cause further annoyance.

Autumn Pruning

Except for newly planted roses, little pruning is necessary in the fall. Hybrid Teas that have made exceptionally vigorous

growth may have the unripe tips of the canes cut off mainly for the purpose of facilitating winter covering. Hybrid Perpetuals that have produced such long canes that there is danger of winter winds whipping them to an extent that the bush may be injured of even twisted off at ground level, should have the top growth reduced or the canes tied to a stout stake driven in the ground.

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A Selected List of Books on Roses

The number of books devoted to roses and rose growing is legion. A selection is listed below. Anyone wishing to keep up-to-date in rose lore should join the American Rose Society, if only for the sake of receiving its publications.

Those marked with * are in the library of the Brooklyn Botanic Garden.
Those marked with † are in the loan library of the American Rose Society.

American Rose Annual. † v. 1, 1916. *† v. 2–24, 1917–1939.

* American Rose Society. *What every rose grower should know.* Harrisburg, 1931.

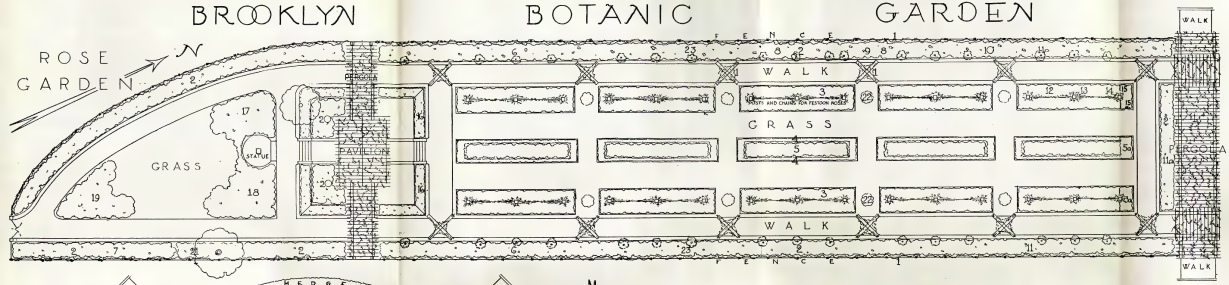
* Bunyard, E. A. *Old garden roses.* N. Y., Scribner, 1936.

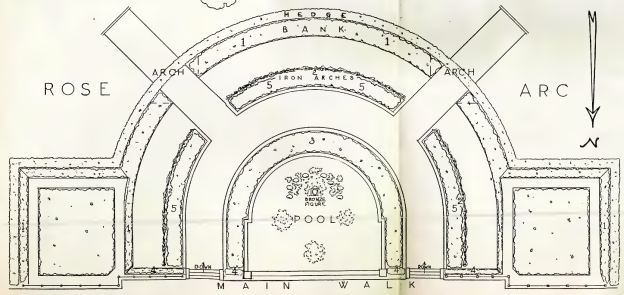
Darlington, H. R. *Roses.* J. C. & E. C. Jack, 1911.

*† Ellwanger, H. B. *The Rose.* N. Y., Dodd, Mead & Co. [c1882].

*† Hole, S. R. *A book about roses.* N. Y., Dutton, 1933.

*† Holmes, Eber. *Commercial rose culture.* N. Y., De La Mare, 1911–26.
*† Jekyll, Gertrude and Mawley, Edward. *Roses for English gardens.* N. Y., Scribner's Sons, 1902.
† Keays, Mrs. F. L. *Old roses.* N. Y., Macmillan, 1935.
*† Melliar, A. Foster-. *The book of the rose.* 2nd ed. Lond., Macmillan, 1902.
*† McFarland, H. H. *Modern roses.* N. Y., Macmillan, 1930.
*† ——. *The rose in America.* N. Y., Macmillan [c1923].
*† ——. *Roses of the world in color.* Boston, Houghton, Mifflin, 1936.
* National Rose Society (England)
Rose annual. 1912–1939
* Nicolas, H. H. *The rose manual.* N. Y., Doubleday, Doran & Co., 1930.
* Paul, William. *The rose garden.* 9th ed. Lond., Kent & Co. [1888].
*† Pemberton, J. H. *Roses.* N. Y., Longmans, Green, 1908.
* Pyle, Robert and others. *How to grow roses.* 16th ed. N. Y., Macmillan, 1930.
* Stevens, G. A. *Climbing roses.* N. Y., Macmillan, 1933.
† ——. *Roses in the little garden.* Boston, Little, Brown, 1926.
*† Thomas, G. C., Jr. *Practical book of outdoor rose growing.* [Phila.] Lippincott, 1917.
*† ——. *Roses for all American climates.* N. Y., Macmillan [c1924].
† Thomas, H. H. and Easlea Walter. *The rose book.* N. Y., Funk & Wagnalls, 1914.
* Willmott, Ellen. *The genus Rosa.* Lond., Murray, 1914. 2 vols.
* Wright, W. P. *Roses and rose gardens.* Lond., Headley [1914].





PLANTING KEY

Rose Garden

1. Climbing Roses on Fences, Arches, Festoon Posts and Chains, Pergolas, and Pavilion
2. Species Roses and Varieties
3. Hybrid Tea Roses

3a. Ancestors of Hybrid Tea Roses

4. Polyantha Roses
5. Hybrid Perpetual Roses

5a. Ancestors of Hybrid Perpetual and Polyantha Roses

6. Rugosa Roses
7. Scotch or Burnet Roses
8. Lambertiana Roses
9. Boursault Roses
10. Prairie Roses
11. Moss Roses

11a. Pemberton Roses
12. Tea Roses
13. China Roses
14. Bourbon Roses
15. Noisette Roses

15a. Ancestors of Noisette Roses

16. Trailing Rugosa Rose Max Graf
17. Unsupported Climbing Roses
18. Historical Roses
19. Sweetbrier Roses
20. Miscellaneous Planting
21. Rhododendrons
22. Umbrella Roses
23. Pillar Roses

Rose Arc

1. *Rosa Wichuraiana* on Banks
2. Climbing Roses on Arches
3. Pemberton Rose, Clytemnestra
4. Trailing Rose Max Graf on Banks
5. Display Hybrid Tea Roses

Note: The scale, for both the Rose Garden and the Rose Arc, is 32 feet to the inch.

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Entrances.—On Flatbush Avenue, near Empire Boulevard and near Mt. Prospect Park; on Washington Avenue, south of Eastern Parkway and near Empire Boulevard; on Eastern Parkway, west of the Museum Building.

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BROOKLYN BOTANIC GARDEN
PUBLICATIONS

RECORD. Established, January, 1912. An administrative periodical issued quarterly (1912–1928); bimonthly (1929–1932); quarterly (1933–). Contains, among other things, the *Annual Report* of the director and heads of departments, special reports, educational *Prospectus, Seed List, Guides.* Free to members of the Garden. To others $1.00 a year. *Guide numbers specially priced.* Circulates in 59 countries.

MEMOIRS. Established, July, 1918. Published irregularly. Not offered in exchange. Circulates in 48 countries.

Volume I. *Dedication Papers:* 33 scientific papers presented at the dedication of the laboratory building. 1917. 521 pages. $3.50, plus postage.

Volume II. The vegetation of Long Island. Part I, The vegetation of Montauk: A study of grassland and forest. By Norman Taylor, June 11, 1923. 108 pages. $1.00, plus postage.

Volume III. Vegetation of Mount Desert Island, Maine, and its environment. By Barrington Moore and Norman Taylor. 1927. 151 pages. $1.60.

Volume IV. *Twenty-fifth Anniversary Papers.* 9 papers on 25 years of progress in botany (1910–1935); 5 papers on horticulture. 1936. 133 pages. $1.35.

CONTRIBUTIONS. Established, 1911. Papers originally published in periodicals, reissued as "separates" without change of paging. 25 numbers constitute one volume. 25 cents each, $5.00 a volume. Circulates in 34 countries.

No. 83. Pteridophyta of the Galapagos and Cocos Islands. 31 pages. 1938.

No. 84. Influence of the growth of the host on oat smut development. 24 pages. 1938.

No. 86. The emergence of smut-inoculated oat seedlings through sand and loam soil. 7 pages. 1938.

No. 87. Flower buds and phylogeny of Dicotyledons. 9 pages. 1939.

LEAFLETS. Established, April 10, 1913. Published weekly or biweekly during April, May, June, September, and October. Contain popular, elementary information about plant life for teachers and others; also announcements concerning flowering and other plant activities to be seen in the Garden near the date of issue. Free to members of the Garden. To others, fifty cents a series. Single numbers 5 cents each. Circulates in 28 countries. Infrequent since 1936.

GUIDES to the collections, buildings, and grounds. Price based upon cost of publication. Issued as numbers of the RECORD; see above.

Guide No. 5. The Rock Garden. 28 illustrations. Price, 35 cents. By mail, 40 cents.

Guide No. 6. Japanese potted trees (*Hachinoki*). 11 illustrations. Price, 35 cents. By mail, 40 cents.

Guide No. 7. The story of our boulders: Glacial geology of the Brooklyn Botanic Garden. 22 illustrations. Price, 35 cents. By mail, 40 cents.

Guide No. 8. The story of fossil plants. 8 illustrations. Price, 35 cents. By mail, 40 cents.

SEED LIST. (*Delectus Seminum*) Established, December, 1914. Since 1925 issued each year in the January number of the RECORD. Circulation includes 160 botanic gardens and institutions located in 40 countries.

ECOLOGY. Established, January, 1920. Published quarterly in coöperation with the ECOLOGICAL SOCIETY OF AMERICA. Subscription, $4.00 a year. Circulates in 48 countries.

GENETICS. Established, January, 1916. Bimonthly, in coöperation with GENETICS, INCORPORATED. Subscription, $6.00 a year. Circulates in 37 countries.

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1939-1940

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BY THE BROOKLYN INSTITUTE OF ARTS AND SCIENCES
BROOKLYN, N. Y.

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10. Expert advice on the choice and care of ornamental trees, shrubs, and herbaceous plants, indoors and out; on planting the home grounds; the care of lawns; and the treatment of plants affected by insect and fungous pests.
11. Determination of botanical specimens.
12. Participation in the periodical distribution of surplus plant material and seeds, in accordance with special announcements sent to members from time to time.
13. Membership privileges in other botanic gardens and museums outside of Greater New York, when visiting other cities, and on presentation of membership card in Brooklyn Botanic Garden. (See the following page.)

OUT-OF-TOWN MEMBERSHIP PRIVILEGES

In accordance with a cooperative arrangement with a number of other institutions and organizations, Brooklyn Botanic Garden members, when visiting other cities, may, on presentation of their Botanic Garden membership card at the office of the cooperating museum or organization, be accorded, without charge, the same privileges as are enjoyed by the members of that institution, including admission to exhibits and lectures, and invitation to social events. This does not include being enrolled on the mailing list for publications, and does not include free admission to the Philadelphia and Boston spring Flower Shows.

In reciprocation, the members of the cooperating units, when visiting the Metropolitan district of Greater New York, will be accorded full membership privileges at the Brooklyn Botanic Garden.

The cooperating units are as follows:

Academy of Natural Sciences, Philadelphia, Pa.
Berkshire Museum, Springfield, Mass.
Boston Society of Natural History, Boston, Mass.
Buffalo Museum of Science, Buffalo, N. Y.
California Academy of Sciences, San Francisco.
Carnegie Museum, Pittsburgh, Pa.
Charleston Museum, Charleston, S. C.
Everhart Museum of Natural History, Science and Art, Scranton, Pa.
Fairbanks Museum of Natural Science, St. Johnsbury, Vt.
Field Museum of Natural History, Chicago, Ill.
Los Angeles Museum, Los Angeles, Calif.
Massachusetts Horticultural Society, Boston, Mass.
Missouri Botanical Garden, St. Louis, Mo.
Newark Museum, Newark, N. J.
New York State Museum, Albany, N. Y.
Peabody Museum of Archaeology and Ethnology, Cambridge, Mass.
Pennsylvania Horticultural Society, Philadelphia, Pa.
Philadelphia Commercial Museum, Philadelphia, Pa.
Southwest Museum, Los Angeles, California.

REGULATIONS CONCERNING PHOTOGRAPHING, PAINTING, AND SKETCHING

1. No permit is required for photographing with a hand camera, or for sketching or painting without an easel on the Grounds or in the Conservatories.

2. Sketching and painting with an easel and the use of a camera with tripod are not allowed in the Japanese Garden, the Rose Garden, the Local Flora Section (Native Wild Flower Garden), nor the Conservatories at any time without a permit. No permits are given for use after 12 o'clock noon on Sundays and holidays.

3. Artists, and the public in general, may not bring into the Botanic Garden chairs, stools, or anything to sit in or on.

4. Holders of permits must not set up tripod cameras nor easels in such a way as to involve injury to living plants or lawns, nor to cause an obstruction to traffic on congested paths or walks.

5. Application for permits should be made at the office of the Director, Laboratory Building, Room 301, or by mail (1000 Washington Avenue), or by telephone (PRospect 9–6173).

BROOKLYN BOTANIC GARDEN RECORD

VOL. XXVIII OCTOBER, 1939 NO. 4

PROSPECTUS: 1939–1940

LIST OF COURSES OFFERED

	Date of First Meeting	Page
Fall Courses, 1939		
Wild Flowers and Ferns of the New York Region	Sept. 16	220
Conifers Around the World	Sept. 19	220
Ornamental Shrubs (Fall Course)	Sept. 20	220
Nature Study (Fall Course)	Sept. 26	224
Herbaceous Plants (Fall Course)	Sept. 27	221
Walks and Talks in the Botanic Garden	Oct. 3	221
Trees and Shrubs in Winter	Oct. 7	220
Fall Nature Study and Gardening (for Children)	Oct. 21	226
Plants in the Home: How to Grow Them	Nov. 1	219
Winter Courses, 1940		
Trips to the Tropics	Jan. 20	221
Winter Course (for Children)	Jan. 20	226
Spring Courses, 1940		
Nature Study (Spring Course)	Feb. 6	224
Fundamentals of Gardening	Feb. 14	222
Plant-Animal Links in the Chain of Life	Feb. 28	223
Spring Nature Study and Gardening (for Children)	March 2	226
Spring Garden Work	March 5	222
Walks and Talks in the Botanic Garden	April 9	221
Ornamental Shrubs (Spring Course)	April 10	222
Herbaceous Plants (Spring Course)	April 11	223
Trees and Shrubs in Spring and Summer	April 13	221
Outdoor Garden Course (for Children)	April 20	227
Wild Flowers and Ferns of the New York Region	April 27	222
Lilacs in Flower	May 1	223
Full Year Courses, 1939–1940		
Flowering Plants and Ferns (Laboratory Study)	Sept. 16	225
General Botany	Sept. 20	224
Greenhouse Work	Oct. 3	225
Elements of Horticulture	Oct. 4	224
Trees and Shrubs of Greater New York	Oct. 7	226
Garden Practice	Oct. 19	225
Plant Culture	Oct. 19	225
Course for Student Nurses		
General Botany with Special Reference to Medicinal Plants	———	227
Investigation		
Research in Mycology and Plant Pathology	———	228
Research in Forest Pathology	———	228
Research in the Structure of Flowers	———	228
Research in the Systematic Botany of the Flowering Plants	———	228

COURSES OF INSTRUCTION

The Brooklyn Botanic Garden offers courses of instruction in botany, gardening, horticulture, and nature study, and also opportunity for research; as follows:

A. For members and the general public ("A" courses, p. 219)
B. For teachers ("B" courses, p. 223)
C. For children ("C" courses, p. 226)
D. Other courses of a special nature ("D" courses, p. 227)
E. Investigation (p. 227)

Any course may be withdrawn when less than ten persons apply for registration and no course will be given for less than six persons. Since registration in many of the courses is restricted to a fixed number on account of the limited space available in the greenhouses, and for other reasons, those desiring to attend are urged to send in their application for enrollment, with entrance fee, to the Secretary, Brooklyn Botanic Garden, several days in advance of the first exercise. This avoids delay at the beginning of the first exercise, ensures a place in the course, and enables the instructor to provide adequate material for the class.

Enrollment.—Persons are requested not to register in any course unless they are reasonably confident that they can attend the sessions of the class regularly and throughout. This is especially important where the number to be enrolled is limited. To register and not attend may deprive someone else of the privilege of attending. With the exceptions noted below, no registrations will be accepted for separate class exercises.

Equipment available for the courses:

Three *classrooms,* two *laboratory rooms,* and three *Instructional Greenhouses;* the *Children's Garden,* occupying about ¾ of an acre and divided into 150 plots for instruction in gardening; at the north end of the Children's Garden, the *Children's Building,* for conferences, and for the storage of tools, seeds, special collections, etc.; the *Auditorium,* on the ground floor, capable of seating 570 persons, and equipped with a motion-picture machine and stereopticon, and electric current, gas, and running water for experiments connected with lectures.

In addition to these accommodations, the dried plant specimens in the herbarium, the living plants in the conservatories and plantations, and the various types of gardens, are readily accessible; while the main library and children's library, which contain a comprehensive collection of publications on every phase of gardening and plant life, may be consulted freely at any time.

A. Courses for Members and the General Public

Although the following courses are designed especially for Members of the Botanic Garden, they are open (unless otherwise specified) to any one who has a general interest in plants. Teachers are welcome. Starred courses (*) are open also for credit to students of Long Island University, and are described in the current Long Island University catalog. In harmony with an agreement entered into in the spring of 1935, the Botanic Garden, upon recommendation of the Chairman of the Biology Department of Long Island University, offers a course scholarship to one student of the University.

Unless otherwise specified, all "A" courses are *free to members,*† but the individual class exercises are open only to those who register for the entire course. Of others a fee is required, as indicated. In courses where plants are raised or collected, these become the property of the class members.

Fall Courses

A1. Plants in the Home: How to Grow Them.—Five talks with demonstrations. This course deals with the principles to be followed in raising plants, and in maintaining them in a healthy, vigorous condition in the home. Practice in potting, mixing soils, making cuttings, etc. The members of the class have the privilege of keeping the plants they have raised. *On account of restricted space in the greenhouse, this class must be limited to 40 persons. Registration according to the order of application. Fee to non-members, $6 (including laboratory fee); to members, $1 laboratory fee. Wednesdays, 11 a.m., November 1 to November 29.*

Mr. Free.

† For information concerning membership in the Brooklyn Botanic Garden consult pages i–iii.

***A5. Trees and Shrubs in Winter.**—Ten outdoor lessons, in the parks and woodlands of Greater New York, on the characteristics of our common trees and shrubs, both native and cultivated, emphasizing their distinguishing features in the winter condition. The habits, requirements as to soil, etc., and the use of various species in landscape art are also discussed. *Fee to non-members, $5. Saturdays, 2:30 p.m., October 7 to December 9.* The first session will be held at the Brooklyn Botanic Garden.

Dr. Graves and Miss Vilkomerson.

A10. Conifers Around the World.—Ten outdoor meetings for a study of the Garden collection of Conifers, their characteristics, uses, and cultivation. 1 and 2—Conifers of Northeastern America. 3—Southeastern North America. 4—Western America. 5—Eastern Asia. 6—Northern and Western Asia. 7—Europe and North Africa. 8—The Southern Hemisphere. 9—The Classification of Conifers. 10—The Cultivation of Conifers. Class members are given small specimens for identification, and seeds of a few species. *Fee to non-members, $5. Tuesdays, 10:30 a.m. to 12 noon, September 19 to November 28.*

Dr. Gundersen and Mr. Doney.

A13. Wild Flowers and Ferns of the New York Region.—Seven sessions. How to know the common plants of woods and roadsides, including identification of fruits and seeds. It is recommended, but not required, that all or part of Course B10 (see p. 225) be taken with this course. *Fee to non-members, $3.50. Saturdays, 2:30 p.m., September 16 to October 28.* First meeting at the Botanic Garden.

Miss Rusk.

***A31. Ornamental Shrubs.**—Eight sessions, held outdoors in the Botanic Garden, to study the common species and varieties of cultivated shrubs, emphasizing those desirable for planting out on the home grounds. Fall flowers and fruits of ornamental shrubs and small trees, also evergreen shrubs, are considered. This is a continuation of the spring course A30. *Fee to non-members, $4. Wednesdays, 11 a.m., September 20 to November 8.*

Mr. Doney.

A40. Botany for Gardeners.—Eight lectures and discussions on fundamental processes in plant life as applied to gardening and horticulture. Designed especially for those interested in amateur gardening. (Not offered in 1939–40.) Dr. Svenson.

A42. General Botany.—Same as course B1. *Fee to members, $5; to non-members, $10.* Miss Rusk.

A44. Walks and Talks in the Botanic Garden.—A course designed especially for Members of the Garden and their friends, to enable them to become acquainted with the general plan of the Garden and the nature of the various special gardens, as well as other features of general interest. *No fee. Tuesdays, 4 p.m., October 3 and 17, 1939, and April 9, 23, May 14, and June 4, 1940.* Dr. Graves.

A45. Herbaceous Plants (Fall Course).—Five outdoor meetings, for the study of fall-flowering herbaceous plants. This is a continuation of the spring course, A39. Some seeds are available, and one lesson early in October is given on vegetative propagation, with some material for class members. *Fee to non-members, $2.50. Wednesdays, 10:30 a.m. to 12 noon, September 27 to October 25.* Dr. Gundersen and Mr. Free.

Winter Course

A22. Trips to the Tropics.—Four guided tours through the Conservatories of the Botanic Garden, with informal, non-technical talks on interesting plants.

1. Foods from far-off lands.
2. Desert gardens.
3. Orchids and pond weeds.
4. Plants of prey.

No fee. Saturdays, 2 p.m., January 20, 27, February 3, 17. Class limited to twenty. Dr. Graves and Miss Vilkomerson.

Spring Courses

***A9. Trees and Shrubs in Spring and Summer.**—Ten outdoor lessons in the parks and woodlands of Greater New York.

Similar to A5, except that the different species are studied in their spring and summer conditions. *Fee to non-members, $5. Saturdays, 2:30 p.m., April 13 to June 15.*

Dr. Graves and Miss Vilkomerson.

A11. Wild Flowers and Ferns of the New York Region.—Eight sessions, in the Brooklyn Botanic Garden and in the woodlands near the City, for field identification of flowers and ferns of spring and early summer. It is recommended, but not required, that all or part of Course B10 (see p. 225) be taken with this course. *Fee to non-members, $4. Saturdays, 2:30 p.m., April 27 to June 15.* First meeting at the Botanic Garden. Miss Rusk.

A25. Fundamentals of Gardening.—Four greenhouse lessons and one outdoors, as follows: making cuttings of herbaceous perennials; sowing seed and pricking out seedlings; demonstration of spring garden work. Lectures will include planning and care of the herbaceous border, and soils. Class limited to 45 persons. *Fee to non-members, $7 (including laboratory fee); to members, $2 laboratory fee. Wednesdays, 10:30 a.m., February 14 to March 20 (omitting March 13).* Date of outdoor lesson to be announced. Miss Shaw and Miss Dorward.

A26. Spring Garden Work.—Six lecture and practical work periods designed to interest those who have taken A25. Besides starting the newer annuals and perennials from seed, lectures on the herbaceous border, trees and shrubs, and the lawn will be given. "Planning the Garden" will be the subject of a lecture given by Miss Alice Recknagel, landscape architect. Class limited to 45 persons. *Fee to non-members, $7 (including laboratory fee); to members, $2 laboratory fee. Tuesdays, 10:30 a.m., March 5 to April 16 (omitting March 12).* Miss Dorward.

***A30. Ornamental Shrubs (Spring Course).**—Ten outdoor meetings on the grounds of the Botanic Garden. The principal flowering shrubs and small trees are considered at their times of flowering, emphasis being placed on their uses in landscape work, their cultivation, and distinguishing characters. *Fee to non-members, $5. Wednesdays, 11 a.m., April 10 to June 12.*

Mr. Doney.

A37. Lilacs in Flower.—Five outdoor lessons. The comprehensive collection of the Garden affords opportunity for the study of about twenty species and a large number of the finest varieties of lilacs. In the last lessons, culture and propagation are taken up; and cuttings, which become the property of those taking the course, are prepared for rooting. *Fee to non-members, $2.50. Four Wednesdays and one Monday, 10:45 a.m. to 12 noon, May 1, 8, 13, 15, and June 5.* Dr. Gundersen and Mr. Free.

A38. Plant-Animal Links in the Chain of Life.—Three illustrated lectures on the divergent but interdependent evolution of the two great lines of life: (1) Water plants and water animals. (2) Land plants and cold-blooded animals. (3) Flowering plants and warm-blooded animals. *No fee. Wednesdays, 4 p.m., Feb. 28, March 14, 28.* Dr. Gundersen.

A39. Herbaceous Plants (Spring Course).—Ten outdoor meetings. Several hundred species of herbaceous plants, including bulbs and rock garden plants, are observed at time of flowering. Small specimens for pressing are given to the class members. *Fee to non-members, $5. Thursdays 4–5:30 p.m., April 11 to June 20, omitting May 30.* Dr. Gundersen.

B. Courses for Teachers

These courses have been accepted by the Board of Education of New York City for "in-service credit," one credit being granted for each 15 hours (with the exception of "B8, Plant Culture"). Through an agreement with Long Island University, undergraduate credit for certain courses will be allowed toward fulfilling the requirements for a university degree, provided the admission requirements at the University and the laboratory requirements have been fulfilled. Such courses are starred (*). By special arrangement with the institution concerned, these credits have also been used as undergraduate credits in other colleges and universities. Nature materials used in the courses, and plants raised become the property of the student.

Members of the Garden are entitled to a 50 per cent. discount from the regular fee for all "B" courses; from other persons

the indicated fee is required. Long Island University students desirous of electing any of these or of the "A" courses should notify Dean Tristram W. Metcalfe or Dr. Ralph H. Cheney, who will give the candidate a card entitling him to admission to the course. The student should present this card at the beginning of the first session of the course.

B1. General Botany.—Thirty two-hour sessions on the life activities of plants, and the structures that make these activities possible. Giving a survey of the plant kingdom as a matter of general information and culture, the course is not organized like an undergraduate college course in preparation for advanced courses. Discussions are supplemented by individual study of plants and plant parts—living, whenever possible. In addition to the higher (seed) plants, representatives of the main groups of lower plants are studied: bacteria, algae, fungi, lichens, mosses, and ferns. Four credits. *Fee, $10. Wednesdays, 4–6 p.m., beginning September 20.* Miss Rusk.

B2. Laboratory Courses in Nature Study.

(a) Fall Course.—Fifteen two-hour sessions in which the students will have the opportunity of becoming familiar with some of the living material in the world about them, the chance to handle and collect specimens which may be used in the classroom, and to plan projects and discuss problems. Mr. Cornelius Denslow, of the Brooklyn Children's Museum, will conduct one session on nature craft. Two credits. *Fee, $10. Tuesdays, 4–6 p.m., beginning September 26.* Miss Hammond.

(b) Spring Course.—Fifteen two-hour sessions on the spring phases of trees, wild flowers, ferns, insects, and birds. Miss Farida Wiley, of the American Museum of Natural History, will conduct a bird field trip during the migration period. Two credits. *Fee, $10. Tuesdays, 4–6 p.m., beginning February 6.* Nature material will be distributed to students whenever possible.
Miss Hammond.

B3. Elements of Horticulture.—Thirty sessions. For teachers only. Lessons in potting and general care of house plants; methods of plant propagation, including the planting of bulbs;

making cuttings (soft wood, and leaf); sowing seeds; preparing for the outdoor garden. Most of this work is carried on in the greenhouses. All plants raised become the property of the student. Two credits. (No credit allowed for a half-year of work.) *Fee, $10. Wednesdays, 4 p.m., beginning October 4.*

Miss Shaw and Miss Dorward.

B5. Garden Practice.—Twenty sessions of one and a half hours each. The course is planned especially for teachers who direct children's garden work. The discussions cover plant materials, planting plans, and methods of organization and procedure. Practical work is given in the greenhouse and the outdoor garden. Two credits. *Fee, $5. Thursdays, 4–5:30 p.m., October 19 to November 23 (9 hours); February 8 to June 6 (21 hours).*

Miss Shaw and Miss Miner.

B7. Greenhouse Work.—Thirty sessions. For teachers only. Open to students who have completed Elements of Horticulture (B3). Further study of plant propagation; culture of a great variety of house plants and spring-flowering greenhouse plants; arrangements in hanging baskets, dishes, and terraria. Two credits. *Fee, $10. Tuesdays, 4 p.m., beginning October 3.*

Miss Dorward.

B8. Plant Culture.—A course of twenty weeks duration for those who have completed Elements of Horticulture (B3) and Greenhouse Work (B7). All work is done in the greenhouses. No Board of Education credits are given for this course. *Fee, $10. Thursdays, 4 p.m., beginning October 19.*

Miss Shaw and Miss Dorward.

***B10. Flowering Plants and Ferns: Laboratory Study.**—Thirty two-hour sessions for those who wish to become better acquainted with wild flowers. Plants are studied for flower structure and family relationships, compared and identified, and mounted as permanent specimens. Fresh plants are pressed during the growing season; dried and preserved plants are used in the winter. The course is most valuable when taken with field courses A11 and A13, but it may be taken alone. Four credits for the laboratory course.

For combinations of laboratory and field work, two credits for each thirty hours approved. *Fee, $10. Saturday mornings, 10–12, beginning September 16.* Miss Rusk.

***B13–14. Trees and Shrubs of Greater New York.**—Twenty two-hour sessions. A course of outdoor lessons in the parks and woodlands of Greater New York, the principal object being to gain a ready acquaintance with the common trees and shrubs of the eastern United States, which are well represented in this region. The species are considered in systematic order, in both winter and summer conditons, and the features pointed out by which they may most easily be recognized. Two credits. *Fee, $10. Saturdays, 2:30 p.m., October 7 to December 9; and April 13 to June 15, 1940.* Dr. Graves and Miss Vilkomerson.

C. Children's Courses

More than thirty separate courses are given Saturday mornings for boys and girls from eight to nineteen years old in the spring, fall, and winter.

The children are grouped according to age and experience. For example, under I (below), twelve separate courses are given; under II, four separate courses; under III, fourteen. Under IV, the Outdoor Garden, 200 children are working from late April to mid-September. This does not represent one course, but many courses combined under one heading, "The Outdoor Garden."

Miss Shaw and Assistants.

I. The Fall Course takes up nature study on the grounds; plant propagation in the greenhouses, using stem and leaf cuttings; bulbs and corms; making of terrariums and dish gardens. Enrollment limited to 175 children. *Fee, fifteen cents. Saturday mornings, 9–11:15, October 21 to December 16.*

II. Winter Course.—Children who have shown unusual ability are chosen from the fall group for early winter work. Group limited to 50. No fee. *Saturday mornings, 9–11:15, January 20 to February 24.*

III. Spring Course.—Nature study and preparation for the outdoor garden, including studies of seed germination, seed sowing

in the greenhouse, and the making of garden plans. All candidates for the outdoor garden must be in spring classes. Enrollment limited to 200. *Fee, fifteen cents. Saturday mornings, 9–11: 15, March 2 to April 13.*

IV. Outdoor Garden Course.—The outdoor garden is open throughout the summer season, and time is arranged to fit in with children's vacation schedules. No child is assigned an outdoor garden who has not had the spring preparatory work. Group limited to 200 children. *Fee, twenty-five or thirty-five cents depending on the size of the garden.* The garden session begins *April 20.*

D. Course for Student Nurses

D1. General Botany with Special Reference to Medicinal Plants.—A course of 10 spring and 10 fall lectures, demonstrations, and field trips for student nurses. Arranged in cooperation with various hospitals. The general principles governing the life of plants, as well as the use and care of flowers and potted plants in the sick room, will be considered. Special attention will be paid to the outdoor identification of officinal plants. Hours to be arranged. *No fee.* Dr. Graves.

E. Investigation

1. *Graduate Work for University Credit*

By the terms of a cooperative agreement between New York University and the Brooklyn Botanic Garden, properly qualified graduate students may arrange to carry on independent investigations in botany at the Garden under the direction of members of the Garden Staff, who are also officers of instruction in the Graduate School of the University. The advantages of the library, laboratories, herbarium, and collections of living plants at the Garden are freely at the disposal of students registered at New York University for such work. Such properly enrolled graduate students are charged no additional fees by the Garden. Research in the following fields may be undertaken:

E6. Research in Mycology and Plant Pathology. Dr. Reed.

E8. Research in Forest Pathology. Dr. Graves.

E9. Research in the Structure of Flowers. Dr. Gundersen.

E10. Research in the Systematic Botany of the Flowering Plants. Dr. Svenson.

2. *Independent Investigation*

The facilities of the laboratories, conservatories, library, and herbarium are available to qualified investigators who wish to carry on independent researches in their chosen field of botany. By "qualified investigators" is meant those who have obtained the doctor's degree or have completed most of the requirements for the doctorate. The laboratories are open for such use only during the hours when the Laboratory Building is regularly open, viz. 9 a.m.–5 p.m. Mondays to Fridays; 9–12 a.m. Saturdays, except on holidays, when the building is closed. There is a charge of $25 per year, payable to the Botanic Garden.

COOPERATION WITH LOCAL SCHOOLS

The Brooklyn Botanic Garden aims to cooperate in every practicable way with the public and private schools of Greater New York in all matters pertaining to the study of plants and closely related subjects. The purpose of the Garden in this connection is to supplement and enrich the school work in the way of instruction, demonstration methods, study material, etc., which otherwise would not be available.

Geography classes, as well as classes in nature study and botany, find the collection of useful plants in the Economic Plant House, the Local Flora Section, the Japanese Garden, and also the Meridian Panel, the Armillary Sphere, and the Labeled Glacial Boulders, valuable adjuncts to their class work. Arrangements may be made by teachers of geography to have their classes study these collections under guidance. Illustrated lectures at the Garden for geography classes may also be arranged.

To visiting college classes in geology and physiography the Botanic Garden offers interesting material for a study of glaciation.

Notable features are a portion of the Harbor Hill terminal moraine (Boulder Hill), the morainal pond (the "Lake"), the labelled glacial boulders, and the Flatbush outwash plain. See Guide No. 7, *"The Story of our Boulders: Glacial Geology of the Brooklyn Botanic Garden."*

Talks at Elementary Schools.—The principals of public or private elementary schools may arrange to have talks given at the schools on various topics related to plant life, such as school gardens and garden work with children, tree planting, the conservation of wild flowers, Arbor Day, etc. If an illustrated lecture is desired, the lantern and operator must be provided by the school, but slides will be furnished by the Botanic Garden. Address the *Curator of Elementary Instruction* for a list of talks and for appointments.

Talks at Secondary Schools and Colleges.—Informal illustrated talks on various subjects of an advanced botanical nature are always gladly given at Secondary Schools and Colleges by members of the staff. Arrangements for such talks should be made with the *Curator of Public Instruction.*

School Classes at the Garden.—Public or private schools, both elementary and secondary, may arrange for classes to come to the Botanic Garden for illustrated lectures by a member of the Garden staff, or for guided tours through the conservatories and outdoor plantations. Such lectures, conservatory trips, and outdoor trips are planned for correlation with the New York City school syllabi in nature study, biology, and geography.

Visiting classes must be accompanied by their teachers, and notice of such visits should be sent at least one week in advance. Blank forms for this purpose are provided by the Garden. Lists of talks and trips offered will be sent on request: for Junior High and Elementary Schools address the *Curator of Elementary Instruction;* for High Schools, the *Curator of Public Instruction.*

The Garden equipment, including plant material, lecture rooms, lantern, and slides, is at the disposal of teachers who desire to instruct their own classes at the Garden. Arrangements must be made in alvance, so that such work will not conflict with other

classes and lectures. For High School and College classes address the *Curator of Public Instruction.* For Junior High and Elementary School classes address the *Curator of Elementary Instruction.*

The principal of any Elementary or High School in Brooklyn may arrange also for a series of six lessons on plant culture to be given to a class during the fall or spring. A small fee is charged to cover the cost of the materials used. The plants raised become the property of the pupils. The lessons are adapted for pupils above the third grade.

Seeds for School and Home Planting.—Penny packets of seeds are put up by the Botanic Garden for children's use. In the early spring, lists of these seeds, order blanks for teachers and pupils, and other information may be secured on application to the *Curator of Elementary Instruction.*

Demonstration Experiments.—Teachers may arrange to have various physiological experiments or demonstrations conducted at the Garden for the benefit of their classes. Communications in regard to these matters should be addressed to the *Curator of Public Instruction.*

Loan Sets of Lantern Slides.—Sets of lantern slides have been prepared for loan to the schools. Each set is accompanied by a short lecture text of explanatory nature. In all cases these sets must be called for by a responsible school messenger and returned promptly in good condition. Address, by mail or telephone, Mr. Frank Stoll, custodian. The subjects now available are as follows. Other sets are in preparation.

1. Plant Life
2. Spring Wild Flowers
3. Common Trees
4. Fall Wild Flowers
5. Forestry
6. Conservation of Native Plants

Study and Loan Material for Elementary Schools.—To the extent of its facilities, the Botanic Garden will provide, on request, various plants and materials for nature study. As far as possible this material will continue to be supplied gratis to elementary schools. Requests from Elementary Schools should be made to Miss Elsie T. Hammond, and material should be called for at the Information Booth on the ground floor.

Study and Loan Material for Colleges, High Schools, and Junior High Schools

Available at the Brooklyn Botanic Garden, 1939–1940

The Botanic Garden is able to supply various plants and plant parts for study; certain protozoa; sterilized nutrient agar; and also material and mounts for exhibit purposes. When containers are necessary, as in the case of agar, algae, and protozoa, they must be furnished by the school.

In the past, the Garden has offered this service gratis, but both on account of the increasing demand and because of the decrease in appropriations, it has become necessary to make a small charge for the material supplied or loaned. A Price List of the various materials furnished will be mailed on request.

Requests should be made by mail or telephone (PRospect 9–6173), at least one day in advance, to Dr. Elizabeth Marcy, and the material should be called for at Room 204. All exhibit material, and other items starred (*) will be mailed if the school pays postage.

LIVING MATERIAL—PLANTS

Algae: 1. Spirogyra, *Pleurococcus, Vaucheria, Desmids, Oscillatoria. 2. *Spirogyra conjugating—preserved material.

Bacteria: 3. *Slant cultures of *B. coli, B. subtilis, Pseudomonas radicicola, Sarcina flava.*

Fungi: Plus and minus strains of bread mold (*Rhizopus nigricans*). 4. *Spores for inoculation. 5. Cultures of each strain. 6. Petri dish inoculated with both strains showing lines of zygospores.

Liverworts:

Thallus only—7. Marchantia. 8. Conocephalum.

Thallus with gemmae cups—9. Marchantia. 10. Lunularia.

Mosses: 11. Protonema. 12. Felt. 13. Felt with capsules.

Ferns: 14. Prothallia. 15. Fern fronds with spores—various species.

Angiosperms:

Plants: For photosynthesis experiments. 16. Tradescantia. 17. Green geranium. 18. Silver geranium.

With fleshy leaves: 19. Bryophyllum. 20. Sedum.

Sensitive: 21. *Mimosa pudica.*

Leaves: 22. Sedum, Sansevieria, Coffee, and others. 23. Bryophyllum—for plant propagation.

Stems: 24. *Twigs to show opposite and alternate leaf arrangement, thorns, terminal buds, etc., 9–12″.

Cuttings: (Unrooted or rooted). 25. Tradescantia. 26. Begonia. 27. Geranium. 28. Coleus.

Material for the study of genetics:

29. *Sorghum seeds for growing F_2 seedlings showing Mendelian ratios:

Red and green seedling color (3:1)—seeds for parents and F_2.

Normal and albino seedlings—lethal factor (3:1).

30. *Pea seeds of tall and dwarf strains.

31. Seedlings of any of the above.

LIVING MATERIAL—ANIMALS

32. Cultures of Paramoecia, Euglena.

33. Drosophila—wild type, white, sepia, vestigial.

STERILIZED AGAR

34. Petri dishes, test tubes, or flasks, sent in clean and dry, one week in advance, will be filled with sterile nutrient agar, or with potato dextrose agar for the study of bacteria and molds.

SPECIMENS AND MOUNTS FOR EXHIBIT

Illustrating the principles of genetics:

Pea seeds illustrating a dihybrid ratio (wrinkled, smooth, yellow, green). 35. In vials. 36. Riker mount.

37. Jimson weed (*Datura*)—mount to show F_2 segregation of spiny and smooth pods.

Corn showing monohybrid and dihybrid ratios:

38. Ears of parents and F_2—seed of F_1 in vial—unmounted.
39. Same mounted in glass covered display case.
40. F_2 ears in glass tubes—for counting kernels.

41. Sorghum—Hybrid vigor—Riker mount of parents and F_1.
42. Sorghum—Inheritance of seed color—Riker mount.
43. Oats—Mendelian inheritance of hull color—Riker mount.
44. Snapdragon—Inheritance of flower color—Riker mount.

Economic plants: 45. Bundles of cereal grains (barley, oats, rice, rye, sorghum, wheat).

Fungi and plant diseases: 46. Bracket fungi—unmounted.

Leaves showing leaf-spot diseases (rusts, mildews, and others).

47. Unmounted. 48. Mounts covered with cellophane.
49. Riker mount—specimens of six diseases.

Mosses and Ferns: Mounts covered with cellophane.

50. Life history of a moss plant—*Polytrichum commune.*

Angiosperms:

51. Riker mount showing leaf modifications.
52. Fruits of trees, flowering plants, weeds, lotus pods—loose.
53. Riker mount to show methods of seed dispersal.

LIBRARY

The rapidly growing library of the Garden comprises at present about 20,500 volumes and about 17,000 pamphlets. This is not a circulating library, but is open free for consultation to all persons daily (except Sundays and holidays) from 9 a.m. until 5 p.m. (Saturdays, 9 to 12). More than 1,000 periodicals and serial publications devoted to botany and closely related subjects are regularly received. These include the transactions of scientific societies from all quarters of the globe; the bulletins, monographs, reports, and other publications of various departments of the United States Government, as well as those of foreign governments, and of all state agricultural experiment stations and agricultural colleges; the publications of research laboratories, universities, botanic gardens, and other scientific institutions of the world, as well as the files of independent journals devoted to the

various phases of plant life. The library is specially rich in publications of foreign countries and has a growing collection of incunabula and other pre-Linnaean works.

Bibliographical assistance is rendered to readers by members of the Library staff.

An annotated list of the incunabula, pre-Linnaean works, old herbals and other rare or historically important books in the Library was published as the July, 1935, number of the Botanic Garden RECORD. Copies are for sale at 40 cents each.

HERBARIA

The Phanerogamic Herbarium consists at present of more than 210,000 specimens of flowering plants.

The Cryptogamic Herbarium contains a large collection of ferns, mosses, liverworts, lichens, and algae. It also contains the mycological collection consisting of approximately 79,000 specimens of fungi and myxomycetes, including the mycological collection of Dr. Franz Bubák, of Prague, for many years director of the Tabor Botanical Garden. This collection, of 33,779 specimens, includes type specimens of more than 500 species new to science, described by Dr. Bubák.

Other exsiccati represented in the Garden herbarium are those of E. Bartholomew; Ellis & Everhart; Jaczewski, Komarow and Tranzschel; W. A. Kellerman; Raciborski; Seymour & Earle; C. L. Shear; H. & P. Sydow; David Griffiths; and others.

These herbaria may be consulted daily (except Sundays and holidays) from 9 a.m. until 5 p.m.; Saturdays from 9 a.m. to 12 m. Specimens may be submitted for identification.

CONSERVATORIES

The Garden conservatories contain a collection of tender and tropical plants. Of special interest for teachers of nature study and geography are the following useful plants from the tropics and subtropics: banana, orange, lemon, lime, kumquat, tamarind, West Indian cedar (the source of the wood used for cigar boxes), eucalyptus, Manila hemp, sisal, pandanus (source of the fiber used for making certain kinds of fiber hats), fig, grapevines from north

and south Africa, date palm, coconut palm, chocolate tree, coffee, tea, ginger, bamboo, mahogany, balsa, cocaine plant, pepper, annatto (used in coloring butter and cheese), cardamom, olive, pomegranate, logwood, durian, mango, sugar cane, avocado (so-called "alligator pear"), West Indian and other rubber plants, banyan, religious fig of India, and numerous others.

It may be of interest to teachers of botany that the nine extant genera of cycads are represented in House 12. To reach the Cycad House take the first door to the *left* after entering the central or Economic House and pass through to the end house.

The Conservatories are open April 1 to October 31, 10 a.m.–4:30 p.m. (Sundays, 2–4:30); November 1 to March 31, 10 a.m.–4 p.m. (Sundays, 2–4).

BUREAU OF PUBLIC INFORMATION

Consultation and advice, and the facilities of the library and herbarium are freely at the service of members of the Botanic Garden and (to a limited extent) of others with special problems relating to plants or plant products, especially in the following subjects:

1. The care of trees, shrubs, and lawns, and general gardening problems.
2. The growing of cultivated plants and their arrangement; also their adaptation to soils, climate, and other factors.
3. Determination (naming) of flowering plants.
4. Plant diseases and determination of fungi.
5. Plant geography and ecology.

Inquiries should be directed to the *Curator of Public Instruction,* preferably by letter.

Determination of Specimens.—If the identification of plants is desired, the material submitted should include flowers, and fruit when obtainable. Identification of a single leaf is often impossible. For identification of plant diseases, representative portions of the part diseased should be sent.

DOCENTRY

To assist members and others in studying the collections, the services of a docent may be obtained. Arrangements should be

made by application to the *Curator of Public Instruction* one week in advance. No parties of less than six adults will be conducted. This service is free of charge to members and accompanying friends; to others there is a charge of 50 cents per person. For information concerning membership in the Botanic Garden see pages i–iii of this PROSPECTUS.

EXTRA-MURAL LECTURES

With the exception of talks to schools, the Botanic Garden does not officially schedule members of its personnel for lectures or talks outside the Botanic Garden, except for lectures on the Garden itself or some aspect of its work. In such cases no fee is charged beyond traveling expenses.

Several members of the personnel are available for lectures to garden clubs and other organizations on topics of general horticultural or botanical interest. A list of lecturers, with lecture topics and the fee charged, may be had by addressing the *Curator of Public Instruction.* Arrangements are to be made directly with the lecturer concerned.

MEETINGS OF OUTSIDE ORGANIZATIONS

The Brooklyn Botanic Garden is glad to welcome outside organizations wishing to hold meetings at the Garden, provided the general purpose of the organization is closely allied to that of the Botanic Garden (e.g., Botanical Groups, Garden Clubs, Nature Study Clubs, Conservation organizations, etc.), or that the specific purpose of the meeting is of mutual interest and advantage to the organization and the Botanic Garden. Meetings must always be arranged for in advance. A folder giving full details, and an application blank may be had by addressing *The Custodian.*

INDEX TO VOLUME XXVIII

Alle alle (Little Awk), 36
Anniversary, A Second Twenty-Fifth, 37
  Twenty-Fifth, 78
Art Commission, 21
Association of Gardeners, National, 37
Attendance, 28, 66, 67
  at Classes and Lectures, 66
    Conservatories, 66
Auchincloss, James C., 29
Auxiliary, Woman's, 27, 38, 146

Ballard, Charles W., 27
Barens, Emil, 86
Beauty in the Garden, The Importance of, 22
Behre, C. Edward, 56
Benedict, Ralph C., 64, 73, 109, 123
Benson, Philip A., 29
Bequest to the Brooklyn Botanic Garden, Forms of, Preceding p. 9
Bird Lists, 75
Bird Lovers Club of Brooklyn, 35
"Birds of the Brooklyn Botanic Garden, Preliminary List of the," 36
Bishop, George R., 123
Blue Tanager (*Thraupis cana*), 36
Blum, Edward C., 29, 39
Blumen, Das entdekte Geheimniss der Natur im Bau und in der Befruchtung der, 17
Board of Education, 32
  Higher Education, 33
Border Mound, 99
Botanic Garden and the City, The, Preceding p. 9
Botany, Systematic, 60
Boys and Girls Club, Brooklyn Botanic Garden, Silver Anniversary Program, 83
  Center, Interboro, 37
Brandwein, Paul F., 53, 123
Brennan, Bernard P., 75
Broadcasting, 14
Brooklyn Bird Club, 75
  College, 30
Buckley, Helen M., 41
Budget, Capital Outlay, 45

Cabot, Mrs. Irving L., 78
Cameron, Ethel, 79
Caparn, Harold A., 19, 22, 159
Capital Outlay Budget, 45
Carroll, Michalena L., 77, 78
Castanea dentata, 55
Centradenia floribunda, 62
Cheney, Ralph H., 27, 65, 110, 124
Chestnut Breeding Work in 1938, 55
Children's Courses, 226
Children's Work, Silver Anniversary of the, 81
  Special Gifts for, 116
City and the Garden, Preceding p. 9, 45
Clark, Mrs. Jay, Jr., 28
Classes and Lectures, Attendance at, 66
  School, 10
Collections Fund, 116
Committee on Medicinal Plants, Advisory, 27
Conservation, Plant, 109
Conservatories, 87
  Attendance at the, 66
Contributions, 42, 141
Cooperation, 29
  with Local Schools, 228
  Miscellaneous, 35
Courses, Adult, 67
Cranford, Mr. and Mrs. Walter V., 21, 159
Culinary Garden, Medicinal and, 100
  Plants, Advisory Committee on, 27

Dauernheim, Augustus M., 29
Davenport, Henry J., 30
Davenport, Mrs. Henry J., 80
Davidson, Maurice P., 30
Delectus Seminum, Brooklyn 1938, 1
Dicotyledons, The Classification of, 60
Dictamnus albus, 62
Dillon, Mary E., 35
Director, The, 141
Docentry, 235
Doney, Charles F., 86
Donnelly, John, Jr., 21
  Studios, 21

Dorward, Margaret M., 68
Doscher, Mrs. Charles, 28
Dovekie (*Alle alle*), 36
Downs, Bernard C., 34
Daniel C., 115
Draper, Mrs. Mary Childs, 29

Eastern Parkway Gate, 24, 46
Ecology (the journal), 140
Economic Plants, 65
Education, Board of, 32
Higher, 33
"Free," 15
New York City Committee for Public Adult, 35
Elementary Instruction for 1938, Report of the Curator of, 76
Eleocharis and Field Work, 63
Endothia parasitica, 55
Endowment for the Department of Elementary Instruction, Ellen Eddy Shaw, 38
Elementary Instruction, 11
"Exhibit of the Week," 75

Farmingdale Iris Garden, 53
Feijoa Sellowiana, 62
Field Secretary for First Half of 1938, Report of, 110
Trips Conducted, 1938, 138
Financial, 42
Fiorenza, Nicholas, 77
Flatbush Chamber of Commerce, 37
Flower Days, 72
Show, International, 35, 101, 116
Forest Pathology, Division of, 56
Fox, Mrs. Helen Morgenthau, 27
Free, Montague, 35, 51, 67, 103, 124, 159
French Class, 77
Friedman, Bernard A., 55
Funds Contributed, 1938, Private, 44

Gager, C. Stuart, 29, 34, 35, 36, 47, 124, 125, 141
Garden Center at Greenwich Village, The, 36
Clubs, 35
During 1938, Attendance at the, 67
Gate, Eastern Parkway, 24, 46
Gates, Washington Avenue, 23
Gauvreau, Marcelle, 77
Genetics (research in), 64
(the journal), 141
Gifts, Contributions and, 42, 141
Received During 1938, 116
Ginkgo, 19
Girls Commercial High School, 41
Goldenson, B. H., 29
Good, James H., 35
Governing Committee, Botanic Garden, 145
Graves, Arthur Harmount, 55, 60, 73, 76, 124, 125
Greenwich Village, The Garden Center at, 36
Gundersen, Alfred, 60, 67, 73, 89, 126

Hamden, Connecticut, Chestnut Species, Varieties, and Hybrids Growing at, 59
Haneman, John Theodore, 19
Harper, Roland M., 64
Hawley, Ralph C., 57
Hay Fever Studies, 75
Healy, A. Augustus, 38
Herbaria, 234
Herbarium, 18
Accessions and Distribution, 92
Cryptogamic, 94
Endowment Fund, 117
for 1938, Report of the Curator of the, 90
on the Mycological, 94
Phanerogamic, 92
Herb Garden, 27
Society of America, 28
Herrick, W. W., 57
High School Science Clubs or Classes, Lectures and Trips for, 69
Horticultural Section, 18, 22, 99
Society of New York, 34
Horticulturist for 1938, Report of the, 97
Hortus, Inc., 29
Hospitals, Cooperation with Four, 37
Hudson River Day Line, 73, 111
Hunter, William T., 29
Hurricane, 26, 101

Income, Need of Additional, 46
Indian Point, 111
Information, Bureau of Public, 76, 235
Requests for, 103
Instruction, Courses of Public, 12, 218
International Service, Department of Elementary Instruction, 85
Investigation, 227
Iris, 51, 87
Garden, Farmingdale, 53
Hybridization, 53

Plantations, 51
Rhizome, Soft Rot of the, 52
Thrips, 52

James Madison High School, 41
Jennison, H. M., 64
Jones, Helen Swift, 67, 111
Jordan, William E., 107, 126

Kay, Mrs. Alfred, 28
Keays, Mrs. Frederick Love, 72
Knot Garden, Elizabethan, 35

Labels, 87
and Signs, 89
Lanman, David H., 39
Leaflets, 141
Lectures, Attendance at Classes and, 66
and Trips for High School Science Clubs or Classes, 69
Extra-Mural, 236
Library, 17, 117, 233
Committee of One Hundred for the Completion of the Brooklyn Central, 35
for 1938, Report on the, 104
Statistical Report on the, 107
"Little Auk" (*Alle alle*), 36
Local Flora Section, 36, 90
Loines, Hilda, 30
Mrs. Stephen, 30
Long Green, 18
Island, Flora of, 75
"Luncheon, Ellen Eddy Shaw," 11

Maddock, Sidney, 23
Mansfield, William, 27
Marcy, D. Elizabeth, 50
Matthews, Kelsey, 29
Maynard, Edwin P., 30
McDonald, James G., 39
McKim, Mead and White, 23, 24
Medicinal and Culinary Garden, 100
Plants, Advisory Committee on, 27
Meetings of Outside Organizations, 236
Members and the General Public, Courses for, 219
List of, 147
Services to, 41
Membership, 40
Information Concerning, Preceding p. 9, 217
Privileges of, Preceding p. 9, 217, 219
Out-of-Town, Preceding page 217
Summary of, 158
Memberships, School, 41
Memoirs, 141
Merrill, Gertrude W., 112
Mrs. Whitney, 40
Miner, Frances M., 36, 40
Moses, Robert, 30
Moss Roses, 174
Mt. Prospect Park, 30, 31
Mudge, Alfred E., 29
Murphy, Margaret L., 76

National Academy of Sciences, 56
Association of Gardeners, 37
Recreation Association, 36
Research Council, 56
Youth Administration, 34, 97
Nelson Brothers Company, 21
Erwin E., 27
Nephrolepis, Experimental Variation in, 64
Nitardy, F. W., 27
North American Outdoor Life Show, 36
Northeastern Forest Experiment Station, 56
Nurses, Course for Student, 227

Oat Hybrids to Loose and Covered Smuts, Studies on the Inheritance of Resistance of, 47
Smuts, Physiologic Races of the, 48
Studies on Experimentally Produced Physiologic Races of the, 49
Observers, Student, 97
Officers of the Brooklyn Institute of Arts and Sciences, 145
Olcott, A. V. S., 111
Organizations Meeting at the Garden in 1938, 138
Meetings of Outside, 236
Osborne, Dean Clay, 21
Memorial, The Dean Clay, 18
Mrs. Dean C., 29, 42, 116
Mrs. Sade Elisabeth, 18

Parks, Department of, 30
Pathology, Plant, 47
Percy turnstiles, 23
Perkins, Mrs. Charles E., 78
Personnel, 39
Pests, 100
Photographic Work, Report of, 140

Photographing, Painting, and Sketching, Regulations Concerning, Preceding page 217
Plantations, 18
Plant Distribution, Seed and, 101
Plants for 1938, Report of the Curator of, 86
Statistics Relating to Living, 89
Police Department, 33
Poplars, Lombardy, 26
Post, James H., 35
Pounds, Mrs. Lewis H., 38
Pratt, Frederick B., 29
Mrs. Frederick B., 29
Mrs. Harold Irving, 29
Prospectus: 1939–1940, 217
Publication, Publicity and, 15
Publications by the Botanic Garden Personnel During 1938, 123
1938, Report on Brooklyn Botanic Garden, 140
Public Instruction for 1938, Report of the Curator of, 66
Publicity and Editorial Work, 73
and Publication, 15
Purdy, Maud H., 60

Racine, Marcel, 77
Radio Garden Club, 14
Talks by the Botanic Garden Personnel During 1938, 136
Record, Brooklyn Botanic Garden, 141
Reed, George M., 47, 51, 87, 96, 126, 127
Registration, Total Adult, 68
Report of the Brooklyn Botanic Garden, 1938, Twenty-Eighth Annual, 9
Research, 16
for 1938, Reports on, 47
Reservoir, Mt. Prospect, 31
Resident Investigator (Economic Plants) for 1938, Report of the, 110
(Ferns) for 1938, Report of the, 108
Retiring Allowances, A Plan of, 47
Robbins, William J., 29
Robinson, Governor, 36
Rodman, William A., 29
Rose Garden, 99
of the Brooklyn Botanic Garden, 159
Species, 162
Roses, Bourbon, 188
China, 188
Climbing, 176
Cultivation of, 199
"Floribunda," 197
Historical, 169
Hybrid Perpetuals, 197
Hybrid Tea, 191
Moss, 174
Noisette, 188
Pemberton, 175
Pernetianas, 194
Polyanthas, Dwarf, 194
Selected List of Books on, 214
Sweetbriers, Hybrid, 172
Tea, 189
Rusk, Hester M., 68, 73, 74

School Art League, 76
Classes, 10
Service, Statistics of, 71
Schools, Cooperation with Local, 228
Schroeder, Frederick, 27, 72
Seed and Plant Distribution, 101
Exchange, 88, 89
Seeds Offered in Exchange, List of, 1
Shaver, J. M., 64
Shaw, Ellen Eddy, 36, 85, 127
Endowment for the Department of Elementary Instruction, Ellen Eddy, 38, 117
Luncheon, Ellen Eddy, 11
Shortia galacifolia, 62
Shrine, Burning of the Shinto, 24
Signs, Labels and, 89
Smith, Floyd F., 52
Smut Investigations, Sorghum, 50
Smuts, Studies on Experimentally Produced Physiologic Races of the Oat, 49
the Inheritance of Resistance of Oat Hybrids to Loose and Covered, 47
Sorghum Smut Investigations, 50
Sprengel, Christian Konrad, 17
Spring Inspection, 38
Spry, Mrs. Constance, 38
Squibb & Sons, E. R., 27
Stanton, T. R., 127
Stellaria media, 62
Stowe, Mr. Frank, 57
Student Observers, 97
Students Enrolled During 1938, Graduate, 53
Svenson, Henry K., 63, 94, 128
Systematic Botany, 60
Section, 99

Talks, Lectures, Addresses and Papers Given by the Botanic Garden Personnel During 1938, 128
Taxing of Knowledge and Education, 42
Teachers, Courses for, 223
Thraupis cana (Blue Tanager), 36
Thrips, Iris, 52
Tilley, S. R., 128
Torrey, Raymond, 88
Totty, Charles H., 29
Trip for Nature Lovers, Wild Flower, 73

U. S. Department of Immigration and Naturalization, 37
Utter, L. Gordon, 49, 52, 128

Vilkomerson, Hilda, 68, 73, 75
Vogt, Rudolph, 21

Wallace, George B., 27
Webster, Mrs. Hollis, 27, 28, 72
Weigel, C. A., 52
Welcome, By Way of, 141
Westbury Horticultural Society, 36
White, Alfred T., 38
Wikander, Elin A. L., 12, 18
Wolcott, Senator, 36
Woman's Auxiliary, 27, 38, 146
Woody Plants in the Garden, 86
Works Progress Administration, 33, 97
Wright, Richardson, 34
Wulling, Frederick J., 27

Yale, Rare Woods Sent to, 75
Young Gate, Richard, 23

BROOKLYN BOTANIC GARDEN RECORD

EDITED BY

C. STUART GAGER

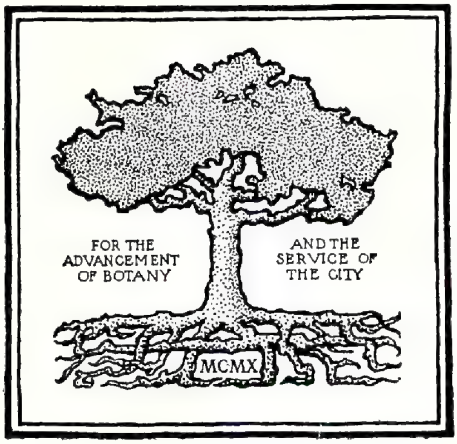

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TABLE OF CONTENTS OF VOLUME XXVIII

No. 1, January

Delectus Seminum, Brooklyn 1938 (List of Seeds Offered in Exchange) 1

No. 2, April

The Botanic Garden and the City ..... Preceding page 9
Information Concerning Membership ..... Preceding page 9
Privileges of Membership ..... Preceding page 9
Forms of Bequest to the Brooklyn Botanic Garden ..... Preceding page 9
Twenty-eighth Annual Report of the Brooklyn Botanic Garden, 1938 ... 9
Report of the Director 9
Reports on Research for 1938 47
Report of the Curator of Public Instruction 66
Report of the Curator of Elementary Instruction 76
Report of the Curator of Plants 86
Report of the Curator of the Herbarium 90
Report of the Horticulturist 97
Report on the Library 104
Statistical Report on the Library 107
Report of the Resident Investigator (Ferns) 108
Report of the Resident Investigator (Economic Plants) 110
Report of the Field Secretary 110
Financial Statement for 1938 113
1. Tax Budget Accounts 113
2. Private Funds Accounts 114
3. Summary of Total Maintenance Budget for 1938 115
Gifts Received During 1938 116
Publications by the Botanic Garden Personnel During 1938 123
Talks, Lectures, Addresses, and Papers Given During 1938 128
Radio Talks by the Botanic Garden Personnel During 1938 136
Field Trips Conducted 138
Organizations Meeting at the Garden, 1938 138
Report of Photographic Work 140
Officers of the Brooklyn Institute of Arts and Sciences 145
Members of the Board 145
Woman's Auxiliary 146
List of Members 147
Summary of Membership 158

No. 3, July

The Rose Garden of the Brooklyn Botanic Garden 159

No. 4, October

Prospectus: 1939–1940 217
Information Concerning Membership i
Privileges of Membership ii
Out-of-Town Membership Privileges iii
Regulations Concerning Photographing, Painting, and Sketching ... iv
List of Courses Offered 217
Courses of Instruction 218
Cooperation with Local Schools 228
Library 233
Herbaria 234
Conservatories 234
Bureau of Public Information 235
Docentry 235
Extra-mural Lectures 236
Meetings of Outside Organizations 236

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GENERAL INFORMATION

Membership.—All persons who are interested in the objects and maintenance of the Brooklyn Botanic Garden are eligible to membership. Members enjoy special privileges. Annual Membership, $10 yearly; Sustaining Membership, $25 yearly; Contributing Membership, $100 yearly; Life Membership, $500. Full information concerning membership may be had by addressing *The Director, Brooklyn Botanic Garden, 1000 Washington Avenue, Brooklyn, N. Y.* Telephone, Prospect 9-6173.

The Botanic Garden is open free to the public daily from 8 a.m. until dusk; on Sundays and Holidays it is open at 10 a.m.

Entrances.—On Flatbush Avenue, near Empire Boulevard and near Mt. Prospect Park; on Washington Avenue, south of Eastern Parkway and near Empire Boulevard; on Eastern Parkway, west of the Museum Building.

The street entrance to the Laboratory Building is at 1000 Washington Avenue, opposite Crown Street.

To Assist Members and others in studying the collections the services of a docent may be obtained. This service is free of charge to *members of the Botanic Garden;* to others there is a charge of 50 cents per person. Arrangements must be made by application to the Curator of Public Instruction at least one day in advance. No parties of less than six adults will be conducted.

To Reach the Garden take Broadway (B.M.T.) Subway to Prospect Park Station; Interborough Subway to Eastern Parkway-Brooklyn Museum Station; Flatbush Avenue trolley to Empire Boulevard; Franklin Avenue, Lorimer Street, or Tompkins Avenue trolley to Washington Avenue; St. John's Place trolley to Sterling Place and Washington Avenue; Union Street or Vanderbilt Avenue trolley to Prospect Park Plaza and Union Street. By Automobile from points on Long Island take Eastern Parkway west and turn left at Washington Avenue; from Manhattan, take Manhattan Bridge, follow Flatbush Avenue Extension and Flatbush Avenue to Eastern Parkway, turn left following Parkway to Washington Avenue; then turn right.

BROOKLYN BOTANIC GARDEN
PUBLICATIONS

RECORD. Established, January, 1912. An administrative periodical issued quarterly (1912–1928); bimonthly (1929–1932); quarterly (1933–). Contains, among other things, the *Annual Report* of the director and heads of departments, special reports, educational *Prospectus, Seed List, Guides.* Free to members of the Garden. To others $1.00 a year. *Guide numbers specially priced.* Circulates in 59 countries.

MEMOIRS. Established, July, 1918. Published irregularly. Not offered in exchange. Circulates in 48 countries.

Volume I. *Dedication Papers:* 33 scientific papers presented at the dedication of the laboratory building. 1917. 521 pages. $3.50, plus postage.

Volume II. The vegetation of Long Island. Part I, The vegetation of Montauk: A study of grassland and forest. By Norman Taylor, June 11, 1923. 108 pages. $1.00, plus postage.

Volume III. Vegetation of Mount Desert Island, Maine, and its environment. By Barrington Moore and Norman Taylor. 1927. 151 pages. $1.60.

Volume IV. *Twenty-fifth Anniversary Papers.* 9 papers on 25 years of progress in botany (1910–1935); 5 papers on horticulture. 1936. 133 pages. $1.35.

CONTRIBUTIONS. Established, 1911. Papers originally published in periodicals, reissued as "separates" without change of paging. 25 numbers constitute one volume. 25 cents each, $5.00 a volume. Circulates in 34 countries.

No. 85. Monographic studies in the Genus Eleocharis. V. 110 pages. 1939.

No. 86. The emergence of smut-inoculated oat seedlings through sand and loam soil. 7 pages. 1938.

No. 87. Flower buds and phylogeny of Dicotyledons. 9 pages. 1939.

No. 88. The Templeton Crocker Expedition of the California Academy of Sciences, 1932. No. 37. The Cyperaceae. 7 pages. 1939.

LEAFLETS. Established April 10, 1913. Published weekly or biweekly during April, May, June, September, and October. Contain popular, elementary information about plant life for teachers and others; also announcements concerning flowering and other plant activities to be seen in the Garden near the date of issue. Free to members of the Garden. To others, fifty cents a series. Single numbers 5 cents each. Circulates in 28 countries. Infrequent since 1936.

GUIDES to the collections, buildings, and grounds. Price based upon cost of publication. Issued as numbers of the RECORD; see above.

Guide No. 6. Japanese potted trees (*Hachinoki*). 11 illustrations. Price, 35 cents. By mail, 40 cents.

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ECOLOGY. Established, January, 1920. Published quarterly in coöperation with the ECOLOGICAL SOCIETY OF AMERICA. Subscription, $5.00 a year. Circulates in 48 countries.

GENETICS. Established January, 1916. Bimonthly, in coöperation with GENETICS, INCORPORATED. Subscription, $6.00 a year. Circulates in 37 countries.